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PRINCIPAL CONTENTS

Page

Growth of Grey-iron Castings Production and Some Factors affecting it

By Lars Villner

Collected foundry statistics for the major European countries with comments on present and future production trends 3

Manufacture and Use of Pearlitic Malleable-iron

By O. K. Hunsaker

This abstract of a paper originally presented at a meeting of the American Society of Mechanical Engineers gives details of the manufacture of pearlitic iron and describes the major uses of the material in industry .. 11

L'accroissement de la Production des Pièces en Fonte grise et quelques-uns des Facteurs l'affectant. Par Lars Villner.
Un recueil de statistiques de fonderies des principaux pays d'Europe avec commentaires sur les tendences de production présentes et à venir 3

Fabrication et Utilisation de la Fonte malléable perlitique.
Cet extrait d'un article présenté pour la première fois au congrès annuel de la Société Américaine des Ingenieurs en mécanique donne les détails sur la fabrication de la fonte malléable perlitique et en décrit ses principales utilisations dans l'industrie 11

Die Zunahme der Graugusserzeugung und einige darauf einwirkende Faktoren. Von Lars Villner.
Eine Zusammenfassung der Giesserei-Statistiken der wichtigsten europäischen Länder mit Bemerkungen über gegenwärtige und künftige Entwicklungsrichtungen der Erzeugung 3

Erzeugung und Verwendung von perlitischem Temperguss. Von O. K. Hunsaker.
Dieser Auszug aus einem (ursprünglich auf der im Jahre 1957 abgehaltenen Jahresversammlung der Vereinigung amerikanischer Maschineningenieure gehaltenen) Vortrage gibt Einzelheiten der Erzeugung von perlitischem Temperguss und beschreibt die Hauptanwendungen dieses Werkstoffes in der Industrie 11

Features, News, Commercial Information and Statistics

Leader: Improving Foundry Recruitment 1
Brassfounders celebrate 150 Years 2
Forthcoming Events 2
Lectures on Steel Scrap 10
G. & J. Weir's Reorganization 12
£7,000,000 Project for Clydeside 12
Equipment and Supplies 13
Law Cases 14
American Letter 15
Dinner: Worshipful Company of Founders 16
Publications Received 17
New Catalogues 17
BA/Alcoa/T.I. Negotiations 19
News in Brief 20
Personal 22
Company News 23
Contracts Open 23
Raw Material Markets 24
Current Prices of Iron, Steel and Non-ferrous Metals 26

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Improving Foundry Recruitment

The Foundry Advisory Committee of the Borough Polytechnic, London, has recommended that in future all applicants to participate in the day-release courses in foundry subjects must be examined by the staff to ascertain whether their standard of education is adequate. This step was taken because too-high a percentage of the first-year students not merely do not pass, but fail miserably. The worst feature of this is the ill-effects on the boys, especially when it happens a second time after re-taking the first-year course. Obviously, it is a waste of time so far as the employer is concerned, a waste of effort on the part of the teaching staff and a waste of public money.

The remedy suggested if a boy fails the preliminary test is that he, his parents and employer shall receive the advice that his part-time release period should be spent at a specified school, where he will receive instruction in arithmetic, elementary science and a few other subjects, and if he passes the examination at the conclusion of the course, he will be entered without question into the courses leading to the City and Guilds certificate. Objections to this procedure were voiced, as some moulders and coremakers are virtually illiterate and despite this some in the past have become owners of well-known foundries. Yet, foundry classes do not produce moulders and the system to be tried is a logical way of effecting an improvement on the existing state of affairs.

The statistics available to the Committee revealed a situation which may or may not be common to the rest of the country, but the lessons to be drawn from it are universally applicable. The effect of the " bulge " in the numbers of school-leavers is already being felt and foundry employers can now pick and choose among boys offering themselves for apprenticeship. If they feel that illiteracy is no bar to making a boy into a first-class craftsman, the modern educational system will not invariably disappoint them, but will provide plenty of lads who will benefit from orderly and systematic training. The hoary story that the foundry only gets the leftovers can at the moment be put into the same category as Grimm and Hans Andersen. If founders during the next few years will be selective in their choice of boys, the need of a preliminary course for them before they enter foundry classes will disappear.

Brassfounders celebrate 150 Years

Last month, the firm of Bowen & Company, Limited, Phoenix Foundry, Mount Pleasant, London, W.C.1, celebrated its 150th year of brassfounding, and to mark the event employees and their wives were entertained to a theatre/dinner party.

The company retains the name of Bowen, although since it was taken over, 80 years ago, by the late Sir Alexander Glegg, grandfather of the present managing director, no Bowens have been connected with the firm. Sir Alexander Glegg was a pioneer, in this country, in the manufacture of sand-cast cooking utensils in pure aluminium, these being first produced in the 'nineties, when the commercial use of aluminium was still in its infancy. At that time, there was much opposition to the use of aluminium in utensils intended for the preparation of food, but eventually this was overcome and soon afterwards large quantities of "Phoenix" brand cast cooking utensils were made for domestic purposes. The larger and heavier vessels, such as those used in hotel kitchens, ships, etc., are still produced complete, *i.e.*, cast, polished, and fitted with handles, etc., at the Phoenix Foundry.

Developments

In the first decade of the present century, the company commenced production of motor cars. A number of both touring models and delivery vans were made and sold before it was decided to abandon this venture and nowadays a few photographs among the archives are the sole remaining evidence of this incursion in the automobile industry. A machine shop was added to the foundry about 75 years ago, since when a proportion of the company's output has consisted of finished-machined castings.

In contrast to the present very up-to-date machine shops, the foundry building itself is very old and contains some curious architectural features. The office block is much older still, probably a Queen Anne building, and prior to the founding of the company in 1808 was believed to have been a hostelry.

Bowen & Company, Limited, to-day continues to produce sand castings in most of the non-ferrous alloys, ranging in weight from ounces up to 10 cwt. In particular the company has had many years experience in the casting of high-tensile brasses and bronzes.

Prescribed Industrial Diseases

A right of appeal from medical boards' decisions, on the question of whether or not a person claiming benefit under the industrial injuries scheme is suffering from one of certain prescribed industrial diseases, is provided by Regulations* made by Mr. John Boyd-Carpenter, Minister of Pensions and National Insurance. The Regulations will apply to decisions given by medical boards on or after January 5, 1959. Appeals by claimants will be decided by medical appeal tribunals who will also consider decisions referred to them at the instance of the Minister. The tribunals, each of which consists of doctors of consultant status sitting with a legal chairman, already consider appeals against medical boards' assessments of the extent of disablement due to an industrial accident or disease.

* National Insurance (Industrial Injuries) (Prescribed Diseases) Amendment (No. 2) Regulations, 1958, S.I.1958 No. 2112, price 3d.

Forthcoming Events

JANUARY 5

Institute of British Foundrymen

Sheffield and district branch :—"General Review of Moulding Methods," by J. B. McIntyre, 7 p.m., at the College of Commerce and Technology, Pond Street, Sheffield.

Lancashire branch :—"Use of Epoxy Resin in the Foundry," by J. F. Bowers, 7 p.m., at the Midland Hotel, Manchester.

JANUARY 6

Incorporated Plant Engineers

Edinburgh branch :—"Selection of Electric Motors for Industrial Purposes," by H. E. Russle, 7 p.m., at 25, Charlotte Square.

Peterborough branch :—"Nuclear Reactor Fundamentals," by R. R. Gunton, 7.30 p.m., at the White Lion Hotel, Church Street.

JANUARY 7

Incorporated Plant Engineers

Leicester branch :—"Application of Thermostatic Controls," by J. S. Smith, 7 p.m., at the Bell Hotel.

JANUARY 8

Institute of British Foundrymen

Stoke-on-Trent section :—"Production of Medium-size Ingot Moulds," by H. P. Millar, 7.30 p.m., in the Stipendiary Court Room, Hanley Town Hall.

Beds & Herts section :—"Modern Foundry for the Manufacture of Small Steel Castings," by T. A. Marsden, 7.30 p.m., at K. & L. Steelfounders and Engineers, Limited, Letchworth. (Liaison meeting with the London branch.)

Incorporated Plant Engineers

Glasgow branch :—"Safety in the Uses of Industrial Gases and Equipment," by T. Recks, 7.15 p.m., at the Scottish Building Centre, 425/427, Sauchiehall Street.

JANUARY 9

Institute of British Foundrymen

Tees-side branch :—"Modern Foundry for the Manufacture of Small Steel Castings by New Moulding Techniques," by J. H. Osborn, R. F. Horton, and T. A. Marsden. (Further details from the secretary.)

JANUARY 10

Institute of British Foundrymen

Newcastle and district branch :—"Design in Relation to the Production of Castings," by G. Elston, 6 p.m., at the Neville Hall, Westgate Road, Newcastle.

Scottish branch :—"Problems in the Production of High-quality Castings," by David Fleming, 3 p.m., at the Royal College of Science and Technology, George Street, Glasgow.

West Riding of Yorkshire branch :—Dinner/dance at the Midland Hotel, Bradford, 6.30 for 7 p.m.

Institution of Production Engineers

Glasgow section: "Machine-tool Development in USSR," by N. Stubbs, 7.30 p.m., at the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent.

Introducing the Author . . .

Mr. LARS VILLNER, whose recent paper to the International Foundry Congress, at Liège, begins on the facing page, has been head of the foundry department of *Sveriges Mekanförbund* (Swedish Association for Metal Transforming, Mechanical and Electromechanical Engineering Industries) since 1951, and editor of *Gjuteriet* (the Swedish foundry journal) since 1952. He was born in 1916, and graduated from the Royal Institute of Technology, Stockholm, in 1942. From 1942 to 1950 he was engaged in metallurgical research work at *Jernkontoret* (the Swedish Ironmasters' Association).

Growth of Grey-iron Castings Production and Some Factors affecting it*

By Lars Villner

It is of great value to all foundrymen to know the trends of development within their industry. The main interest is generally concentrated on technical progress, but it is equally important to know something of the size of the foundry industry in the future. Other materials and methods seek to replace grey iron, a material which has from the beginning been one of the mainstays of the machine age. In this Paper the growth of grey-iron production during the last decades is studied, and some views given on the factors determining it. With this knowledge, deductions can be made concerning the anticipated development of cast iron. However, the Author has no intention of predicting production in years to come; that difficult task is left to the prophets, and to those unfortunates whose duty it is to make estimates for the future, and to base important decisions on their guesswork. The first part of the paper, given below, deals mainly with statistical data.

This investigation does not primarily seek to explain the unemployment which lately has appeared in a number of countries. This problem will however be dealt with briefly at the end of the paper. It would have been an advantage if the whole foundry industry could have been studied and not only the grey-iron section. The Author has refrained from that because the overall picture would have been unduly obscured if all the cast metals, with their different trends of development, had been treated simultaneously. After all, grey iron dominates the foundries and accounts for about eighty per cent. of foundry production in most countries. There are many similarities between grey iron and other metals, so that several of the conclusions based on the grey-iron data are also valid for the whole foundry industry.

STATISTICAL DATA

Grey-iron Production in Various Countries

Investigations of conditions in the foundry industry are complicated by the fact that production statistics are incomplete in most countries. For that reason it has been necessary to confine this study to four countries only, *i.e.*, Great Britain, Sweden, USA and Germany. Some aspects of the statistical data which are available are considered in the Appendix.

Fig. 1 shows the production of grey-iron castings in various countries, the USA taking pride of place with a production of well over 10 million metric tons per annum. Then follows the USSR with somewhat more than 5 million *tonnes* and Great Britain and Germany with 3 to 4 million *tonnes*. Swedish production is on quite a different scale and amounts to about 400,000 *tonnes* per annum. It is interesting to note that the effect of changes in the business cycle on the production of cast iron is similar in all countries, excepting, of course, the USSR. Production rose sharply after the war owing to pent-up demand and the desire to replenish stocks. The production peak for all countries came in 1951-1952 and then, as is known, came the 1953 recession. After that the curves rise slightly again, but level out or sink during 1956 and 1957. Compared with other industries, the foundry industry is subject to extremely marked variations in business conditions. This is due to the fact that it is a basic industry. It is characteristic that the first signs of a recession are to be found in the foundries, and the drop in production is eventually greatest there. When business activity is brisk, the production curve for castings is higher than the general level in other industries. These factors render statistical calculations more difficult.

Per Capita Consumption of Grey Iron

The calculations presented here refer in the main to conditions in four countries, three of which are big industrial nations, and the other, Sweden, very much a "little brother." Sweden has, however, the longest record of production figures, and it is desirable to use them in this study. In order to be able to assess to what extent the results for Sweden can be compared with those for other countries, it is important to know whether or not Sweden has reached approximately a similar stage of industrial development. Fig. 2 shows the *per capita* consumption of cast iron in kgs. per annum. The figures are based on average data for the period 1955 to 1957 and, as far as possible, allowance has been made for imports and exports of castings. *Per capita* calculations are liable to be influenced by a number of uncertain factors and it is not advisable to attach more than a limited value to them. Natural resources differ from country to country (*e.g.*, without mines, there is no need for mining machinery), as does foreign trade (as a rule, the smaller the country the greater its foreign trade in proportion) and, finally, there are traditional differences in production and consumption.

The data given in Fig. 2 establish that the four countries under review, *i.e.*, Sweden, Germany,

* Paper presented to the Liège International Foundry Congress last year. Particulars of the Author's career are recorded on the facing page.

Grey-iron Castings Production

Great Britain and the USA, have a cast-iron consumption *per capita* of the same magnitude. This fact indicates a similar degree of industrial development. The figures for cast-iron consumption in other European countries are perhaps not

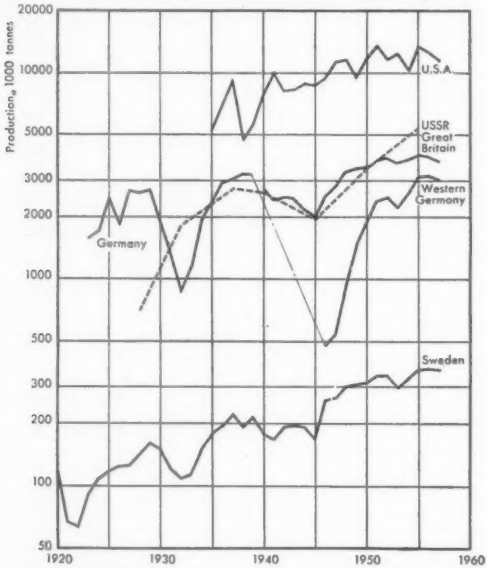


FIG. 1.—*Grey-iron production in various countries.*
(Throughout the illustrations "*tonnes*" indicates the metric unit of 2,000 lb.)

very accurate; however they do indicate a lower level of cast-iron consumption in those countries. Ingot moulds and cast-iron pipes have been deducted from total production for some countries; the remainder, here called net grey-iron production, consists of engineering castings and consumer goods. In this case also, the total differences are small. As further evidence of the stage of industrial development, an estimate has been made of the per *capita* consumption of rolled or forged steel, which is the only basic material of greater importance to the engineering industries than cast iron. It is found that the proportions of the consumption between the countries in question are the same for steel as for cast iron, but that steel consumption is about five times as great. An exception is the USA, in which country steel consumption is about 30 per cent. higher than in the immediately following countries. This may be considered as a confirmation of the well-known fact that the USA is well ahead of the Western European countries in technical development.

GROWTH OF GREY-IRON CONSUMPTION IN SWEDEN

The growth in the consumption of grey-iron castings, measured in *tonnes*, in Sweden will be dealt with fairly exhaustively, since the Author is best acquainted with Swedish data. At the same time, details will be given of the statistical methods employed. The calculations refer to the period 1923 to 1957, which is a sufficiently long period to produce fairly accurate regression lines. The earlier periods are merely of historical interest. The Author considered allowing the period to begin in the " 'thirties," but decided that the figures would then be too few, since most of the calculations had to exclude the years 1940 to 1945. It is obvious that the war gave a special structure to industry. Thus, for the period 1923 to 1957 there are 29 sets of annual values. The calculations refer to the consumption of grey-iron castings, rather than the production, because the Swedish imports of castings (mainly cast-iron pipes) are so large that they influence the figures considerably. To facilitate recording, indices have been used throughout instead of the actual values. 1935 has been chosen as the base year (Table I).

Rate of Growth, 1923 to 1957

In studying the development, it is advisable first to examine the fixed-period rate of growth. The best way to do this is to use a semi-logarithmic diagram in which the regression line is straight as long as the annual percentage increase remains in the main unchanged during the period under review. The trend line is calculated mathematically by the least square method. During the period studied, the rate of growth of Swedish consumption of grey-iron castings was 3.6 per cent. a year (Fig. 3). After the war, the rate was slightly lower, *i.e.*, 3.4 per cent. Major fluctuations in the business cycle result in the actual consumption differing considerably from the trendline for several years but mainly the relation to the regression line is good.

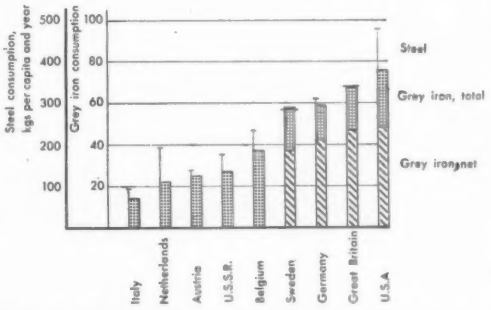


FIG. 2.—Per capita *consumption of grey-iron and steel in various countries. The amounts are in kgs. per annum and based on average data for the period* 1955-1957.

This regression line has been computed also for net grey-iron consumption (total consumption excluding ingot moulds and pipes). This is of special interest to Sweden, because production of ingot moulds has increased greatly during the past 10

years in conjunction with a rise in steel production from 1.2 to 2.7 million *tonnes*. Furthermore, since the war, large-scale production of centrifugally-cast iron pipes has been established in Sweden. However, most foundrymen consider both these types of castings to be special manufactures, and what they are most interested in is the trend of development in respect of engineering castings and consumer goods.

The net consumption of grey iron has risen somewhat more slowly than total consumption (3.2 against 3.6 per cent.). The fact which may cause concern is that the rate of growth has been decidedly lower during the past decade, *i.e.*, 1.8 per cent. However, this is due, in part at least, to the heavy demand for castings in the late "'forties," which considerably lifted the first section of the curve. It then rose only slowly owing to a change in the business cycle and consumption of stocks.

TABLE 1.—*Industrial Statistical Data for Sweden, Germany, USA and Great Britain* (For sources of data, see Appendix).

Year.	Sweden				Germany				USA				Great Britain			
	Grey-iron consumption.*		Total industry.	Metal products industries.	Grey-iron production.†		Total industry.	Metal products industries.	Grey-iron Production.		Total industry.	Metal products industries.	Grey-iron production.		Total industry.	Metal products industries.
	Thou. tons.	Index.	Index.	Index.	Thou. tons.	Index.	Index.	Index.	Thou. tons.	Index.	Index.	Index.	Thou. tons.	Index.	Index.	Index.
1923	113	54	52	41	1,268	67	48	40								
24	129	62	59	47	1,371	72	70	59								
25	140	67	60	51	1,990	105	82	67								
1926	146	70	66	55	1,459	77	79	57								
27	146	70	69	58	2,170	115	99	79								
28	165	79	72	63	2,105	111	104	103								
29	191	92	81	75	2,270	120	104	100								
30	182	87	83	78	1,530	81	89	79								
1931	159	76	78	74	1,036	55	75	57								
32	127	61	72	63	694	37	62	38								
33	138	66	74	64	956	50	71	52								
34	180	86	89	82	1,557	82	86	75								
35	209	100	100	100	1,896	100	100	100	5,397	43	35					
1936	231	111	109	108	2,342	124	114	121	7,110	57	42					
37	270	129	122	132	2,440	129	127	141	9,382	75	46					
38	232	111	123	137	2,600	137	137	159	4,793	39	36					
39	280	134	134	146	2,583	136			5,678	46	43					
40	211	101	123	148					7,870	63	50					
1941	196	94	120	155					9,979	80	65					
42	226	108	127	169					8,165	66	79					
43	232	111	133	177					8,363	67	95					
44	226	108	140	182					8,886	71	93					
45	174	83	138	147					8,689	70	80					
1946	283	136	167	196	483	26			9,317	75	67	58	2,578	70	70	66
47	302	145	172	200	572	30			11,708	94	75	64	2,892	78	75	73
48	340	163	183	216	929	49	71	63	11,599	93	78	64	3,337	90	81	78
49	329	158	190	229	1,462	77	103	103	9,570	77	72	58	3,442	93	86	83
50	337	161	197	241	1,885	100	129	141	11,708	94	84	69	3,543	96	94	91
1951	387	185	206	253	2,403	127	153	184	13,598	109	90	78	3,812	103	98	97
52	377	181	202	258	2,512	133	164	206	11,667	94	93	87	3,892	105	95	97
53	332	160	204	243	2,237	118	178	217	12,436	100	100	100	3,696	100	100	100
54	380	182	213	258	2,619	138	200	256	10,462	84	93	90	3,802	103	108	110
55	423	203	226	280	3,159	167	230	315	13,461	108	104	99	3,988	108	114	121
1956	423	203	232	290	3,194	168	248	343	12,574	101	107	103	3,961	107	113	117
57	419	201	243	296	3,057	161	262	358	11,489	92	107	105	3,774	102	116	119

* For Sweden: consumption = production + import — export. † 80 per cent. of Germany's total production (1923-1938).

Growth of Total Industry, and Metal Products Industries

It has been shown that the consumption of castings during the 35-year period under review conforms to a line indicating a certain annual growth. Time is, however, not a prime determinative factor for the quantity of castings manufactured. The consumption is directly dependent on the development within such other branches of industry as use the products of the foundry industry. Consequently, it is not possible to say whether the rate of growth in the foundry industry has been satisfactory until it is compared with the general industrial production. To estimate the future foundry production, calculations must be based on the prospects of the consumer industries, and not merely on an automatic growth of the foundry industry. Further aspects of this question will be considered later. The general index of Swedish industrial production rose by 4.5 per cent. per annum during the period 1923 to 1957, while the value for the post-war period was 3.1 per cent. (Fig. 4). The rate of growth was higher in the largest grey-iron consuming sector, the engineering industries, which will here be referred to as the metal products industries. In this case also a decline in growth was noted after the war; 3.7 per cent. as compared with 6 per cent. per annum during the whole period. In the case of both these curves, the sensitivity to changes in the business cycle was lower,

Grey-iron Castings Production

and the rate of growth higher, than in the foundry industry.

Grey-iron Consumption as a Function of General Industrial Production

Grey iron—total industrial production

In Fig. 5 the index of grey-iron consumption is plotted against the general index of industrial production. The points representing the different

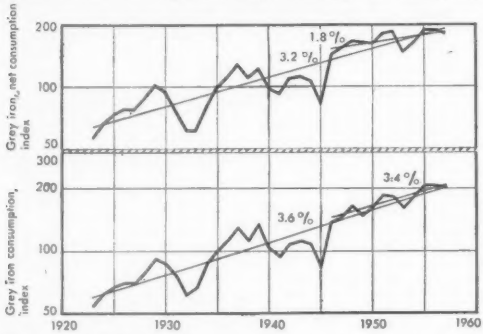


FIG. 3.—*Index of grey-iron consumption in Sweden,* 1923-1957. *Total consumption* (*lower diagram*); *net consumption, excluding ingot-moulds and pipes* (*upper diagram*). *Base year* 1935 = 100.

years in the scatter diagram are evenly distributed, indicating that it should be possible to calculate a regression line mathematically. Several different equations can be used to express a regression line. In growth studies power functions are, however, to be preferred. The first step in the calculations was, therefore, to examine whether a power function with the following equation was applicable, *viz.*,

$$y = a \cdot x^b$$

where x = index of industrial production
y = index of grey iron consumption
a and b are constants.

The logarithmic form of the equation is:

$$\log y = \log a + b \log x.$$

In this case the equation has the following constants:

$$y = 2.04 \cdot x^{0.838} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (S\,1)$$

The correlation of the data for the different years to a curve following this equation was very satisfactory, with a correlation coefficient of 0.99.

The value of the constant a is of little interest, but the exponent b gives us a great deal of information. It shows the variation of log y as log x changes and correlates changes in y with proportional changes in x. In a logarithmic diagram the gradient of the curve is $\frac{d\,(\log y)}{d\,(\log x)}$. This derivative is termed the elasticity of the function. It has the important property of being independent of the units in which the variables are measured. In the chosen function b represents a constant elasticity. If the volume of the total industrial production should rise by 1 per cent., the corresponding increase for the foundries would be approximately the same as the exponent (in this case about 0.838 per cent.). Thus, compared with the rest of industry, the foundry industry grows at a lower rate. The reasons for this will be dealt with later in this Paper.

It may be mentioned that equations of several other types for the regression line, fitting to the points in the scatter diagram, could probably have been found. For example a linear equation with the constants:

$$y = 19 + 0{\cdot}77\,x$$

gives practically the same correlation coefficient as the logarithmic function. A linear function is from certain viewpoints easier to handle than a logarithmic function, but in this case a logarithmic function is more consistent with the trends shown in Fig. 3 and 4, because it relates proportional changes in the variables. A linear function, on the other hand, relates absolute changes in one variable with absolute changes in the other. In a scatter diagram of the type shown in Fig. 5, it may be difficult to decide the relationship between certain years and the regression line. For this reason, the same figures are shown in a different way in Fig. 6. First, a

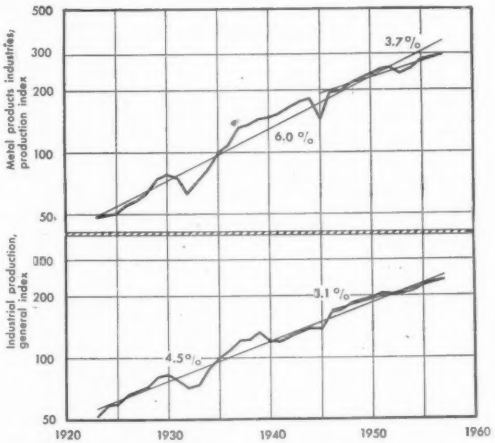


FIG. 4.—*Indices of production in total industry, and metal products industries, in Sweden from* 1923 *to* 1957. *Base year* 1935 = 100.

curve representing the actual index values for the consumption of castings has been drawn. Then, for every year, the consumption of castings has been calculated on the basis of the equation and the known x-values. The resulting y-values indicate what the consumption would have been, had it strictly followed the regression line. These estimated values form an average curve, around which the curve showing actual consumption varies (with

considerably more accentuated business cycle variations), but otherwise shows good correlation. It is remarkable that the correlation factor is as high as 0.99, despite the deviations caused by these regular changes in industrial activity.

Grey iron—metal products industries

It could be expected that the relation between the consumption of grey iron and production within the metal products industries—its most important consumers—should be more clearly defined than that for industry as a whole. This, however, is not the case; the resulting curves of the type shown in Fig. 6 are practically identical in both cases. The correlation factor is the same, 0.99, and the equation similar:

$$y = 5.22 \cdot x^{0.637} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (S\,2)$$

The coefficient b is lower when the calculations are based upon the index of metal products industries than it is when based upon the general industrial index. This indicates a lower relative rate of growth, although the opposite relationship would have been more natural. The basic explanation is simple: the engineering industry grows at a more rapid rate than does total industry (see Fig. 4). The truth of the matter must be that the growth of the engineering industry is to a large extent connected with the production of goods that only make little use of iron castings (*e.g.*, radios, televisions, refrigerators, etc.).

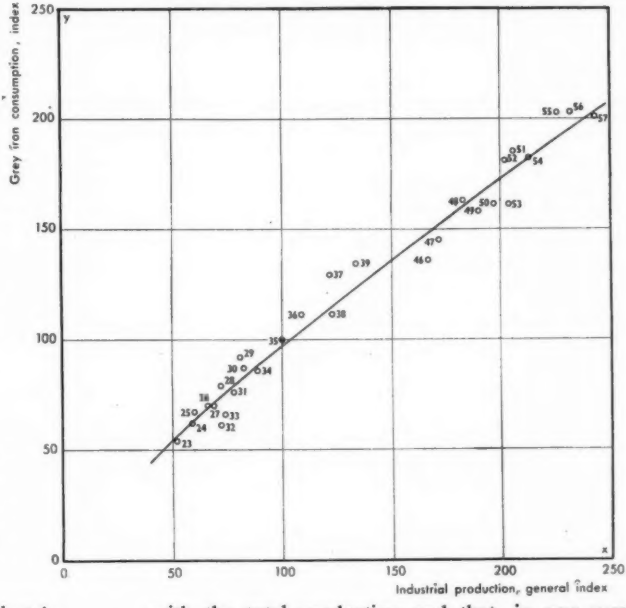


FIG. 5.—*Grey-iron consumption in relation to total industrial production in Sweden, from* 1923 *to* 1957. *The curve follows equation* S1, *which is* $y = 2.04 \times 0.838$.

Net consumption—metal products industries

At last the relation between the net consumption of grey iron (total consumption excluding ingot moulds and pipes) and the index of production in metal products industries has been surveyed. In this case a very close connection is to be expected, because the net consumption mainly consists of machine castings delivered to the engineering industries.

The equation is:

$$y = 6.95 \cdot x^{0.580} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (S\,3)$$

The correlation coefficient is somewhat lower, 0.97, mainly because the business cycle variations are larger (Fig. 6, lower right hand corner). This is probably due to the fact that the steel and building industries have developed at an even rate in Sweden, and consequently ingot moulds and cast-iron pipes have been able to exercise a levelling effect on total consumption. As compared with the previous equations, the coefficient b has decreased, indicating a considerably slower growth of the output of machine castings than might have been expected in view of the development of the engineering industries.

GROWTH OF GREY-IRON CONSUMPTION IN GREAT BRITAIN, THE USA AND GERMANY

The growth calculations for Great Britain, the USA, and Germany are based on the *production* of iron castings instead of the consumption. Thus, imports and exports of castings, details of which were not available to the Author, have not been taken into consideration. It may be assumed that foreign trade in castings in these countries, although in itself important, is small compared with the total production and that, in any case, the annual variations are probably small.

Great Britain

British figures for total grey-iron production are available from 1940 onwards. However, deducting the war years, we are left with only 12 years. This is indeed a short period for statistical computations, but it has been found that a relatively satisfactory correlation coefficient, 0.91, has been obtained. The power function is very similar to those found earlier, *viz.*:

$$y = 3.46 \cdot x^{0.730} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (GB\,1)$$

As will be seen from Fig. 7 the agreement between the estimated and the actual values is fair. This applies also to the corresponding estimated curve, based on metal products industries, instead of

Grey-iron Castings Production

total industry. An attempt has been made to calculate the equation for the net production of grey-iron as correlated to metal products industries. However, this produced a correlation coefficient of only 0.73. The equation is:

$$y = 13.6 \cdot x^{0.441} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{(GB 3)}$$

The gradient 0.441 seems to be of the correct magnitude. When the actual index figures for the net grey-iron production are examined (Fig. 7, bottom right) it is obvious that the increase recorded since 1948 is small. As has been the case in Sweden, the increase in grey-iron production has been largely attributable to ingot moulds and cast-iron pipes.

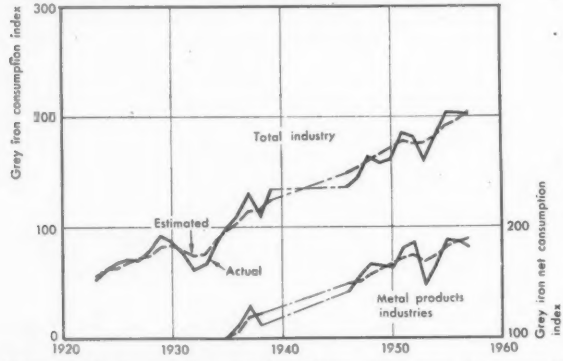


FIG. 6.—*Actual, and estimated, index values of grey-iron consumption in Sweden, from* 1923 *to* 1957. *The estimates are based on equations S* 1 *and S* 3. *Base year* 1935=100.

USA

American figures for grey-iron production are available from 1935, but those for the first 3 to 4 years are considered to be doubtful. The war years 1942 to 1945 have not been included and thus 19 years are left on which to base these calculations. With total grey-iron production as y, and the general index of industrial production as x, the equation is:

$$y = 3.17 \cdot x^{0.755} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{(US 1)}$$

The correlation coefficient is as high as 0.92. Fig. 8 shows the actual and the estimated index figures. After the war, especially, the variations in production were considerable, and it is consequently difficult to comment on possible future development. The general trend, however, conforms well with that in Great Britain and Sweden. As in the case in those countries, the rate of growth as compared with the index for the metal products industries is lower than when compared with total industrial production:

$$y = 10.6 \cdot x^{0.497} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{(US 2)}$$

No data are available for net grey-iron production until 1949, which leaves only nine years as a basis for calculations; this is insufficient to produce a reliable equation.

Western Germany

Apart from Sweden, Germany is the only country for which production data for cast iron are available as far back as 1923. The figures for 1923 to 1938 apply, of course, to the undivided Germany of that time. It is probable that immediately prior to the last war, cast-iron production in the part of the country now known as Western Germany accounted for about 80 per cent. of the total production. It has been assumed here that this percentage was applicable throughout the period, although this naturally introduces an element of uncertainty (Table 1). The equation for the relation between grey-iron production and total industrial production is:

$$y = 2.57 \cdot x^{0.770} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{(D 1)}$$

The actual and estimated index values are plotted in Fig. 9. Variations from the estimated curve arising from changes in the business cycle are greater than those arising in the corresponding curves for the other countries. This is also demonstrated by the lower correlation coefficient, 0.85, which can be considered acceptable because the variations occur regularly.

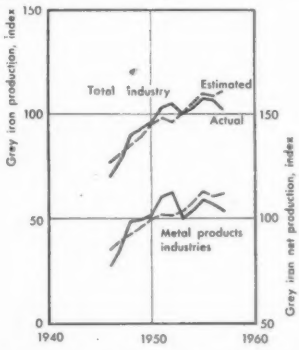


FIG. 7.—*Actual, and estimated, index values of grey-iron production in Great Britain. The estimates are based on equations GB* 1 *and GB* 3. *Base year* 1953 = 100.

During the 1930's and the first part of the post-war period, German industrial production bore marks caused by the impact of well-known circumstances. This, unfortunately, introduces an additional source of error to that mentioned above. As a result, no far-reaching conclusions should be drawn from the equation for Germany. However, it can be noted that the rate of development of foundry production is somewhat further behind the growth of total industry than is the case in Sweden, but corresponds remarkably well with the values

for Great Britain and the USA. A calculation for the total grey-iron production *versus* the index of metal products industries gave the equation:

$$y = 7.83 \cdot x^{0.540} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{(D 2)}$$

As before, the slope of the curve is less steep than that based upon the total industry.

Finally, a calculation has been made for the net grey-iron production (total production excluding ingot moulds and pipes) *versus* the metal products industries. With an exponent of 0.534 (. . . D 3) the gradient of the curve is about the same as that

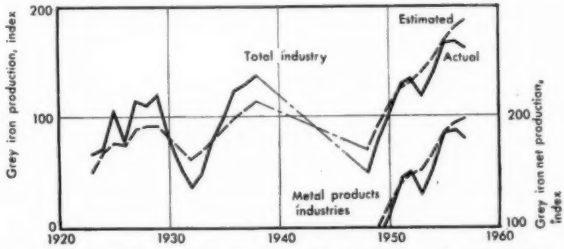


FIG. 9.—*Actual, and estimated, index values of grey-iron production in "Western" Germany, from* 1923 *to* 1957. *The estimates are based on equations D* 1 *and D* 3. *Base year* 1935 = 100.

derived from total production. The actual and estimated curves are very similar to those for total grey-iron *versus* total industry (Fig. 9, bottom right).

Comments on the Rate of Growth

This study of the rate of growth of grey-iron production in these four highly-industrialized countries has shown that the rates are surprisingly similar, especially as the statistical data were not com-

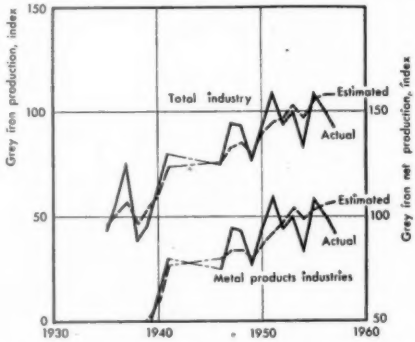


FIG. 8.—*Actual, and estimated, index values of grey-iron production in the USA, from* 1935 *to* 1957. *The estimates are based on equations US* 1 *and US* 2. *Base year* 1953 = 100.

prehensive, and special influences had also affected the issue in some of the countries. It has been found that the actual production of grey iron is rising in all the countries studied, but at a fairly low rate. It is lower than that for industry as a whole and characterized in a power function by an exponent of 0.7-0.8 (Table 2). In itself, this fact is not particularly astonishing. Industry is comprised of a large number of trades, some of which expand faster than others. Obviously, the growth of the foundry industry lies below the average value. Yet it *is* remarkable with regard to the fact that the industries to which most foundry products are delivered have developed at a faster-than-average rate. This is especially true of the engineering industries, and also of the steel and building industries, and volume of private consumption. The foundry industry is lagging behind in these cases to an extent expressed by power function exponents of 0.4 to 0.7.

Just how much does this influence the size of the foundry production? What do the figures show? Assume that the usual power function has the exponent 0.75 and that the basic index value, for both foundry production y, and industrial production x, is 100. The equation is then:

$$y = a \cdot x^{0.75}$$

Therefore $\log y = \log a + 0.75 \cdot \log x$

When $x_0 = y_0 = 100$ we get

$$\log a = 0.5$$

Let it be assumed that industrial production is doubled, *i.e.*, $x_1 = 200$.

Then $\log y_1 = 0.5 + 0.75 \cdot \log 200 = 2.22575$

and $y_1 = 168$

Foundry production has thus risen by 68 per cent. The results of corresponding computations at other exponents are shown in Table 3.

In making estimates, suitable x-values can often be derived from the long-term programmes of expected growth of industry, compiled in most countries. It may be mentioned that increases in the index values for industrial production of 50 to 100 per cent. have been common during the post-war period (for example, industrial production in Great Britain increased from 70 in 1946 to 116 in 1957). If, during this period, grey-iron production in Great Britain had increased at the same rate as industrial production generally, 7,300,000 *tonnes* of grey-iron castings would have been made in 1957, instead of only 3,800,000 *tonnes*. This lower rate of growth of the foundry industry has resulted in a considerable loss of production even during this relatively short period. To this must be added a further disturbing factor, *viz.*, the suspicion that the structure of the rate of development has changed lately. A detailed examination in Fig. 6 to 9 of the actual production figures for the last years shows that they are below the estimated curve for the normal trend in the case of every country. This is

TABLE 2.—*Equations Relating Grey-iron Production to General Industrial Production.*

The equations are based upon the following periods:—Sweden: 1923–39, 1946–57, base year, 1935. Great Britain: 1946–57, base year, 1953. USA: 1935–41, 1946–57, base year, 1953. Western Germany: 1923–38, 1948–57, base year, 1935.

Index of grey-iron production* y	Index of industrial production x	Equation $y = a.x^b$		Correlation coefficient r
Total production	Total industry	Sweden	$y = 2.04\ x^{0.838}$ (S 1)	0.99
		Great Britain	$y = 3.46\ x^{0.730}$ (GB 1)	0.91
		USA	$y = 3.17\ x^{0.755}$ (US 1)	0.92
		Western Germany	$y = 2.57\ x^{0.770}$ (D 1)	0.85
Total production	Metal products industries	Sweden	$y = 5.22\ x^{0.627}$ (S 2)	0.99
		Great Britain	$y = 5.99\ x^{0.609}$ (GB 2)	0.93
		USA	$y = 10.6\ x^{0.497}$ (US 2)	0.92
		Western Germany	$y = 7.83\ x^{0.540}$ (D 2)	0.87
Production, excluding ingot moulds and pipes	Metal products industries	Sweden	$y = 6.95\ x^{0.550}$ (S 3)	0.97
		Great Britain	$y = 13.6\ x^{0.441}$ (GB 3)	0.73
		Western Germany	$y = 8.55\ x^{0.534}$ (D 3)	0.88

* For Sweden: consumption = production + import − export.

TABLE 3.—*Index Values Calculated by the Power Function $y = a.x^b$;* y = foundry production; x = industrial production. Basic values: $x_0 = 100$; $y_0 = 100$.

Exponent b	x_1	y_1	x_2	y_2
0.0	150	100	200	100
0.1	,,	104	,,	107
0.2	,,	108	,,	115
0.3	,,	113	,,	123
0.4	,,	118	,,	132
0.5	,,	123	,,	141
0.6	,,	128	,,	152
0.7	,,	133	,,	162
0.8	,,	138	,,	174
0.9	,,	144	,,	187
1.0	,,	150	,,	200

remarkable because, as a rule, this only occurs during recessions in industry. General industrial activity has been on a high level during the past few years and the actual figures should, as in boom periods, have been either on or above the estimated curve. The deviation is slight, though, and it is not possible on the basis of only a few annual values to make any definite statement as to whether they indicate a change in the trend. However, it will be interesting to follow the development during the coming few years.

(*To be continued*)

Lectures on Non-ferrous Scrap

A course of eight lectures on technological aspects of the non-ferrous scrap-metal industry has been arranged and will be given in Lecture Room L.24 on successive Wednesday evenings in the Department of Metallurgy, College of Technology, Gosta Green, Birmingham. The course is intended for technical staff engaged in the non-ferrous scrap industry and will comprise broad surveys of the various topics given below. In addition to a lecture, there will be opportunity for discussion and questions on each evening. Lectures will be illustrated as required by slides and films. Owing to the limitation of accommodation available, only 80 students can be admitted to the course; application should be made on a special form which can be obtained on application to the Metallurgy Department. The fee for the whole course is £2 2s. 0d.

Programme

January 28, 1959: "Metallurgical Background of the Non-Ferrous Scrap Metal Industry," by Dr. I. G. Slater (head of Department of Metallurgy); *February* 4: "Copper and Copper-base Alloys," by Mr. H. J. Miller, M.SC., F.I.M., (I.C.I. Metals); *February* 11: "Light Alloys," by Dr. E. G. West (Aluminium Development Association); *February* 18: "Other Non-ferrous Metals and Alloys, including Lead, Tin, Zinc, Nickel," by Mr. T. J. McDonald, B.SC., A.I.M., A.C.T. (Birm.) (visiting lecturer, Department of Metallurgy); *February* 25: "Sampling of Non-ferrous Scrap Materials, their Analysis and the Control Techniques Commonly Used," Part I, by Mr. S. J. Silk, A.C.T. (Birm.), F.R.I.C., A.I.M. (visiting lecturer, Department of Metallurgy); *March* 4: "Sampling of Non-ferrous Scrap Materials, etc.," Part II, by Mr. J. B. Atkinson, B.SC., A.R.I.C., F.I.M. (senior lecturer, Department of Metallurgy). *March* 11: "Principles involved in the Sorting, Melting, Refining and Casting of Scrap Metals," by Mr. S. J. Silk, and *March* 18: "Commercial Practice in the Non-ferrous Scrap-metal Trade," by Mr. V. Brenner and Mr. G. Levy (members of the Council of the National Association of Non-ferrous Scrap Metal Merchants).

British Standards Institution

An announcement from the British Standards Institution recalls that a new British Standard (B.S. 2939) was published in January, 1958, primarily to assist local authorities and hospitals to procure good-quality brushes in a comprehensive range of sizes. It is, however, pointed out that several manufacturers in the industry are still receiving orders referring to the old War Office Specification TG26. This has in fact been superseded by B.S. 2939, which also includes specifications for many brushes not previously standardized. It would be helpful to all concerned if purchasing officers would familiarize themselves with the terms of the new standard and use it as a reference point when they are in the market for new brushes.

Cupola Operations and Developments

A series of lectures dealing with theories, current practices and developments in the most important aspects of cupola work will be given in the Industrial Metallurgy Department of Birmingham University from March 23 to 25. The fee is two guineas. Further information and application forms are obtainable from the secretary, Department of Industrial Metallurgy, The University, Edgbaston, Birmingham, 15.

Manufacture and Use of Pearlitic Malleable-iron*

By O. K. Hunsaker

In the following paper an account is given of the manufacturing and control processes for making pearlitic malleable-iron castings. The properties of the material—and in particular its hardenability—are described, and the author concludes with a few notes on the uses of such castings in the automobile-, railway-, and farm-equipment industries.

The first step in making pearlitic malleable castings is the melting of the raw materials. Most of the larger foundries melt by the duplex process, using a cupola for continuous melting, and an air or electric furnace for holding the molten metal, and further refinement. Smaller foundries use batch melting in air or electric furnaces. A typical cupola charge—of say 1.33 tons—would include the following:—steel scrap, 720 lb.; sprue, 1,050 lb. (gates and risers); pig-iron, 230 lb.; limestone, 120 lb., and coke, 330 lb.

All raw materials are bought to specification and sample lots of raw materials are checked by the foundry laboratory upon arrival. During the melting process, analyses are made every 30 min. on carbon; every hr. on silicon and manganese, and every 3 hr. on sulphur, phosphorus, and chromium. Test blocks are poured every 20 min. and broken to check metal fracture. The metal is cast as white cast-iron, which is used to make both standard malleable and pearlitic malleable, the only difference being in the heat-treatment applied. The metal is normally poured into the moulds at a temperature of about 1,482 deg. C.

Moulding

Most of the castings are made in green-sand moulds, but some are also made in dry-sand moulds and "shell moulds" (resin-bonded sand). Shell moulds are used for castings which have to be made with very accurate dimensions, or in intricate shapes or pockets, or for parts which have to be accurately balanced.

The castings may be cored internally to provide efficient shapes and passages as needed by design requirements. After the castings cool in the mould they are cleaned and inspected for foundry defects, and sample lots are checked for dimensional accuracy, magnafluxed for cracks and X-rayed for soundness as a quality check.

Annealing

First Stage

The castings are heated to about 954 deg. C. for approximately 12 hr. They are then lowered in temperature to about 899 deg. C., dumped out of the furnace on to vibrating screens, and cooled by large volumes of forced air.

Second Stage

In the second-stage annealing, the castings are drawn in a continuous furnace at temperatures of 649 to 716 deg. C., depending on the particular ASTM grade the customer requires. Sample lots are checked from each batch for proper Brinell hardness to maintain accurate control. Specimens are also cut from castings and polished to check the microstructure. Standard $\frac{2}{3}$-in. tensile test-bars are pulled from each lot to check yield, ultimate strength, and elongation.

Castings requiring further local hardening after the first-stage annealing are reheated to 843 deg. C., and quenched in a constant-temperature oil bath at a temperature of about 63 deg. C. The castings are then drawn in the same manner as the other ASTM grades.

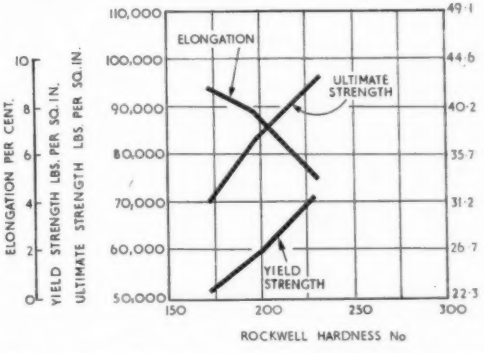


FIG. 1.—*Typical properties obtained from air-quenched pearlitic malleable-iron test-bars.*

Finishing

After annealing, the gates and fins are removed either by shearing or grinding. The castings are then cleaned in shot-blast-type cleaning machines to remove any foreign material on the inside and outside of the casting. They may then be straightened in dies in hydraulic presses to remove any anneal warpage, and given a final inspection for visual defects. If desired, the castings may be gauged for critical dimensions.

Properties Obtained

Fig. 1 shows typical test-bar results for air-quenched pearlitic malleable. Fig. 2 shows typical

* Abstracted from "Pearlitic Malleable Manufacture and Use," a paper contributed by the Production Engineering Division of the American Society of Mechanical Engineers to the Society's annual meeting in New York. The author is technical director of Ironton Malleable Division of the Ironton Malleable Iron Company, Ohio.

Pearlitic Malleable-iron

test-bar results for oil-quenched pearlitic malleable. Pearlitic malleable castings may be hardened by flame or induction-hardening procedures, which process consists of simply heating the casting to the desired temperature and quenching in oil or water. The material is very stable and has excellent non-distortion properties under selective hardening. The hardenability is shown by the typical curves in Fig. 3. The machinability of pearlitic malleable is about 120 per cent. when compared to mild steels. It may be machined with or without coolants.

Uses in Industry

In the automobile and truck industries pearlitic malleable castings are used for spring hangers; differential cases; power steering-gear housings; shift levers; universal yokes; wheel hubs; planet-gear carriers for automatic transmissions; torque-converter housings; brake shoes, and brake-support

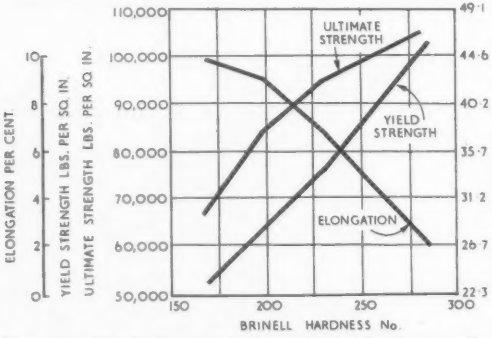


FIG. 2.—*Typical properties obtained from oil-quenched pearlitic malleable-iron test-bars.*

spiders. Railway applications include bearing housings for sealed wheel bearings, bearing adapters and wedges, and various brackets. In farm equipment pearlitic malleable castings are used for frame side rails; brackets; adjusting arms, and implement

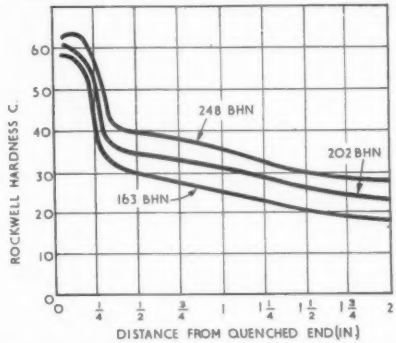


FIG. 3.—*Jominy (water-quench) hardness results obtained from four grades of pearlitic malleable.*

parts where good strength and wear properties are required. Amongst miscellaneous uses, they may be employed in crankshafts for compressors (refrigeration and small gas engines), and sprockets on chain drives, and on road equipment such as bulldozers, and off-the-road trucks, for brackets; large nuts; brake shoes; brake spiders and planetary reduction units. Pearlitic malleable castings are also used extensively for hardware and appliance parts. The foregoing is only a partial list of the many applications of the material.

Acknowledgments

The Author wishes to acknowledge the foundry statistics which were furnished by Jim Lansing, technical director of the Malleable Founders' Society, and also the technical data which was provided by R. W. Heine, associate professor of mining and metallurgy, University of Winconsin.

G. & J. Weir's Reorganization

Following the resolutions approved by stockholders last year, the name of G. & J. Weir, Limited, engineers and founders, etc., of Glasgow, was changed to G. & J. Weir Holdings, Limited, on December 24. The Cathcart trading undertaking is being transferred to a new subsidiary company bearing the name of G. & J. Weir, Limited, as relinquished by the parent company. The parent company will thereafter operate as a holding company under the direction of the present board, which is:—Mr. J. Kenneth Weir (chairman); Mr. J. W. W. Drysdale (deputy chairman); Mr. J. Russell Lang; Mr. N. M. Niven; Sir Charles Connell, and Mr. J. A. Lumsden. Mr. John Davidson is retiring from the post of secretary of the company and is succeeded by Mr. J. J. B. Young.

The board of the new subsidiary company comprises:—Mr. J. Kenneth Weir (chairman); Mr. J. Russell Lang (managing director); Mr. J. W. Atwell (deputy managing director); Mr. A. C. Smith (sales); Mr. J. J. B. Young (finance); Mr. Gavin Milligan (works), and Mr. R. S. Silver (technical). Mr. Harvey Waugh becomes secretary.

£7,000,000 Project for Clydeside

The Inchgreen Investigating Company—set up a year ago to probe the possibility of building a giant drydock for the Clyde—has agreed on a £7,000,000 plan for a project at Great Harbour, Greenock. Interim chairman of the company, General Sir Graham Macmillan, head of Greenock Harbour Trust, speaking of the project said: "We have got substantial financial backing from the Clydeside yards. Now we are ready to ask the Chancellor of the Exchequer what assistance he can give us." In his Budget speech in April, the Chancellor announced that assistance would be given in the construction of drydocks where there was potential unemployment, but there had to be substantial support from private enterprise. The graving dock and ancillary installations would give immediate construction work for about 400 men.

The company hope the biggest customers for a drydock at Greenock will be the tankers which sail to Finnart in Loch Long to discharge their cargo through the pipeline to Grangemouth. Clyde-built ships which at present have to dock at Liverpool after test runs would also be able to use it.

Equipment and Supplies

Pressure-die-casting Machine

The Projectile & Engineering Company, Limited, has now introduced through its sales organization at 28 Victoria Street, London, S.W.1, a new range of die-casting machines, consisting of three models—the 40DC5, 50DC10 and 60DC20. One of these, the 60DC20, having a locking pressure equivalent to 750 tons, was demonstrated recently to members of the technical Press. All machines in the new series are hydraulic and semi-automatic, a general view of the 60DC20 model being shown in Fig. 1. Table 1 and the following notes record the salient features of this model, as arranged for cold-chamber operation suitable for the production of aluminium, magnesium and brass castings.

The machine base is of fabricated steel plate-sections as is the hydraulic tank, which supports the electric motor and hydraulic pumps together with the appropriate main hydraulic control valves. The locking of the die is carried out by a fully-balanced quick-acting cast-steel toggle mechanism and provision is made to adjust the opening stroke of the moving platen by means of a control device in the locking cylinder. Die height adjustment is carried out by means of a motor-operated large-diameter central screw, with push-button control (or manual operation in emergency). The moving die platen is a steel casting as also is the moving back plate. This double platen assembly forms a rigid-box construction which affords an excellent overall bearing length and hence stability. The thrust of the hydraulic lock is taken up by four high-tensile steel tie-bars, of which the two uppermost may be withdrawn to facilitate the mounting of large dies.

Injection Unit

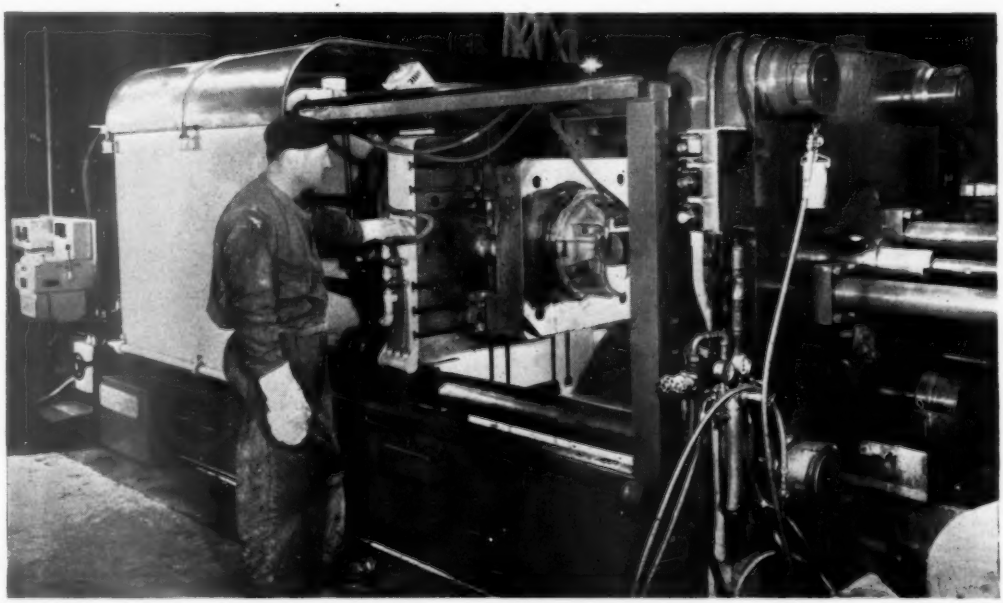
The injection unit is mounted on an outrigger fixed to the machine base, and is adjustable to allow centre, or below centre, injection. The thrust of the unit is taken by two tie bars which are anchored to the fixed platen. The hydraulic control valves associated with the injection unit are mounted adjacent to this unit together with a nitrogen accumulator. A feature claimed for the firm's design of injection system is that high speeds are possible without the extensive use of large valves, and with no drop in line pressure. The injection-cylinder unit is constructed to give a fast initial rate of injection, to be followed up with a high pressure slow "squeeze." This changeover from high speed to high pressure occurs only when the molten material in the die cavity is packed under pressure, and is virtually instantaneous. Thus the high-speed injection is at all times backed up by a high pressure slow "squeeze." The changeover is made possible by the elimination of the possibility of cavitation in the injection cylinder, which may occur with certain types of high-speed injection systems. Therefore, the danger of porosity in the casting, or short shots, is reduced to a minimum.

Ejection

A central hydraulic ejector-cylinder is built into the machine and is fully interlocked with all the other machine movements, thus ensuring that ejection takes place at the required position in the cycle. The design of the electrical sequence control is such that it caters for the ejector to be used as a central core-puller, and allows the core to be withdrawn when the dies are closed. This permits smaller draft angles to be used, and minimizes distortion during subsequent ejection.

All control operations are initiated by push button, and the sequence in which individual operations take place during the cycle, before and after injection has

FIG. 1.—*PECO 60DC20 Pressure-die-casting machine in operation at Berliet Works, France.*



Equipment & Supplies

taken place, is infinitely variable. A system of interlocking is incorporated which ensures that when casting, no operation can take place until the one immediately preceding is satisfactorily completed. The machine is fitted with power-operated safety gates, which are interlocked with the electrical and hydraulic circuits of the machine in such a way that it is impossible for the mould-halves to close unless the safety gates are shut.

Specification Details of the 60D Unit:—

Die Lock: Locking force, 750 tons; die-closing adjustment, 21 to 32 in.; die height, 35 in. max. and 19 in. min.; platen size, 53 by 57 in. vert., and 37⅜ by 40⅜ in. vert. between tie-bars, and ejection stroke, 12 in. hydraulic, or 4 in. mechanical.

Machine Details: Centre line of machine from floor, 47½ in.; hydraulic line pressure, 1,000 lb. per sq. in., with a 35-h.p. motor.

C20 (Cold) Injection Unit: Shot capacity, 26 lb.; plunger stroke adjustment, 18 to 22 in.; injection-ram force, 42½ tons; effective plunger stroke, 17 in.; injection positions, central and 10 in. below, and the injection plunger protrudes 4½ to 8½ in. beyond the platen.

Capacity: According to the size of plunger, the shot weight (calculated at 0.97 lb. per cub. in.) varies from 6.55 to 26.22 lb., the respective minima and maxima being: Plunger dia. 2½ to 4½ in.; pressure on metal 23,930 to 5,975 lb. per sq. in., and maximum casting area 70.2 to 281.1 sq. in.

Electric Tractor

Wessex Industries (Poole), Limited, West Street, Poole, Dorset, are now marketing the "Wrigley" industrial electric tractor (model E1000) (Fig. 2). It has a speed of 6 to 7 m.p.h. running light, and 3 to 4 m.p.h. with a ten-ton load on trailers on level concrete. The tractor weighs 45 cwt. (including batteries) and is 6 ft. 8-in. long by 3 ft. 6-in. wide, with a wheelbase of 35 in. and a clearance of 4½ in. under the rear axle.

The motor (48 volt d.c.) drives direct through a short propeller shaft with two Layrub universal joints to the double-reduction rear-axle, bevel drive with differential. The four-wheel hydraulic brakes are foot-operated, with an independent mechanical parking handbrake.

Other features are: steel, detachable, bolt-on wheels; pneumatic tyres; half-elliptic front and rear springs; full-lock Ackerman-type steering on front axles with roller-bearing kingpins; heavy channel-steel welded chassis; heavy steel-plate body; front and rear towing hitches with 1-in. pins, and a rear-view mirror.

FIG. 2.—*"Wrigley" electric tractor, marketed by Wessex Industries (Poole), Limited, of Dorset.*

Law Cases

Steelworker Loses Claim

Claim for £3,000 damages brought by a Hamilton (Lanarkshire) steel worker who had been dissatisfied with the £587 awarded by Lord Strachan in a separate action in the Court of Session in 1956, has been dismissed as incompetent by the second division of the Court. This upheld a decision by Lord Cameron of last July.

The steelworker, Mr. James Balfour, had sued his employers, William Beardmore & Company, Limited, for £5,000 damages in respect of his having been incapacitated by pneumoconiosis. Mr. Balfour acquiesced in Lord Strachan's assessment of the damages, but subsequently raised a second action for £3,000 damages against Archibald Baird & Son, Limited, Glasgow, by whom he was employed from 1927 to 1943.

In his judgment, the Lord Justice-Clerk (Lord Thomson) said it was frankly admitted that the object of the action was to seek a fresh assessment of the pursuer's loss, but having acquiesced in the judgment of Lord Strachan, he must be regarded as having obtained satisfaction. His damage had, in law, ceased to exist and the obligation of Baird & Son was extinguished.

Lord Patrick, who concurred, described the action as unprecedented. A number of employers might by their negligence have contributed to a pursuer contracting pneumoconiosis. Was he to be allowed to bring successive actions for the same damage until he had obtained an award with which he was satisfied? Lord MacKintosh also concurred.

Costly Foolhardiness

The plaintiff, who "by his own foolhardiness" largely contributed to an accident at work, found his claim for damages considerably reduced when his action came before Mr. Justice Donovan at Birmingham Assizes.

He was Mr. Richard Charles Clark, a fitter, who claimed damages for personal injuries from Dartmouth Auto Castings, Limited, Smethwick (Staffs), alleging breach of statutory duty and negligence. The company denied the allegations and claimed that Mr. Clark had been negligent.

Mr. Clark said he found that sand for castings which was coming down a chute, clogged the machine. He went up a ladder to find the cause of the obstruction, and was about to come down to fetch a tool when the ladder slipped and his hand was caught by a moving belt.

The judge found that because the machinery was unfenced, the firm could not escape the provisions of the Factory Act. But another and more effective cause of the accident was Mr. Clark's conduct, which was "foolhardy in the extreme." Full damages would have been £597, he said, but he found that Mr. Clark was responsible to the extent of 75 per cent. Accordingly, he awarded him damages of £149 with one half of his costs.

THE GOVERNORS of the Heriot-Watt College, Edinburgh, have decided to support an appeal to Scottish industrialists to accept more foreign students in their firms. It is thought that if more foreign students were accepted a greater number of British students could be sent abroad. Last year there were 829 foreign students in Britain, but only 774 British students went abroad.

American Letter

Developments in melting, moulding, and casting design were considered at the Michigan Regional Foundry Conference held at the University of Michigan, Ann Arbor, Michigan, October 15 to 16. A. H. Homberger (International Automation Corporation, Ann Arbor, Michigan), presented a motion picture, "The Buhrer Automated Moulding and Pouring Method," which described some features of an automatic moulding installation. (This process was described in the June, 1958, issue of *Foundry*.)

Moulding Practice

The opening technical session dealt with moulding techniques for obtaining castings with accurate dimensions, a subject discussed by five speakers. Prior to the meeting blueprints of a hook, a medium-sized ring sprocket, and a small connector plate were forwarded to the speakers, and some of the discussion centered around those parts. The speakers indicated that requested dimensional tolerances on some portions of the castings were too strict for even those moulding processes which produce extremely close tolerances.

Shell Moulding

Shell moulding was discussed by Joseph Arloff (central foundry division, General Motors Corporation, Saginaw, Michigan). His firm's foundry employs a coated resin sand of 105 AFS grain fineness for both moulds and cores. About 10,000 shell moulds, and approximately the same number of cores, are made daily, using about 160 tons of metal. Moulds are poured in the horizontal position, and to aid in rapid cooling they are sprayed with water shortly afterwards.

Investment Casting

Charles W. Schwartz (Misco Precision Casting Company, Whitehall, Michigan), spoke on investment casting procedure. He stated that the recently developed Monoshell process has many advantages over the conventional investment method. In this method the disposable wax or plastic pattern is coated with finely divided refractory until a shell about ¼-in. thick is built up. Then it is coated with a coarser refractory aggregate. After air drying the shell moulds are fired, melting out the pattern and converting the resulting shell mould into an extremely rigid structure.

CO_2 Process

The CO_2 process was discussed by Frank Ilenda (Diamond Alkali Research Centre, Painesville, Ohio). The speaker pointed out that sodium-silicate binder is seldom employed alone due to certain characteristics, particularly difficulty in breakdown or disintegration after contact with some molten metals. This trouble is minimized by addition of organic materials to the silicate, and by the further additions of seacoal or pelleted pitch.

Parlanti Process

Some features of the Parlanti permanent-mould process were described by Roger Vennerclassen (Niforge Engineered Castings Incorporated, Boston). In this process the moulds are made of aluminium with the cavity faces anodized. They are designed on the basis of the quantity of heat to be extracted from the casting or castings.

Louis J. Pedecini (Congress Die-casting Division, Tamm Corporation, Detroit), pointed out the advantages of making certain types of castings by the pressure-die-casting method.

The session was concluded by Dr. Richard A. Flinn (University of Michigan), who stated that one of the difficulties in producing castings lies in the reactions occurring at the metal-mould interface. These reactions are primarily caused by the presence of an oxidizing atmosphere in the mould cavity. In sand moulds such an atmosphere promotes the reaction between molten iron and silica in the sand, forming silicate slags which can cause poor surfaces on the castings, and often result in surface inclusions or slag holes.

Melting Furnaces

The afternoon sessions dealt with melting. Howard Wilder (Vanadium Corporation of America, Chicago), discussed cupola melting and traced some of the early history leading to the present-day high-melting rate, hot-blast, water-cooled cupola. The first development in water cooling was, he said, the use of external water glands to reduce refractory consumption. Later the glands were placed inside the shell and coated with refractory. To-day, he continued, shells are cooled with water sprays, or with films of water which flow down over the shell, and in many cases no refractory is employed on the inside. Protruding, water-cooled tuyeres are also employed.

Hot-blast equipment began with the use of the recuperative system, Mr. Wilder said, taking partially unburned gases from the cupola and heating the air blast to a few hundred degrees. Improvement of that system and development of externally heated units permitted air temperatures of up to 650 deg. C. Eventually, use of the hot blast had been combined with water cooling.

Induction Melting

Induction melting of non-ferrous alloys was covered in two sessions. H. M. Rowan (Inductotherm Corporation, Delanco, New Jersey), spoke on the use of high-frequency type furnaces for brass and bronze melting, and G. F. Kolle (Ajax Engineering Company, Trenton, New Jersey), discussed the application of line or 60-cycle type furnaces for melting aluminium and zinc. The high-frequency units operated on frequencies from 180 to 3,000, and cost roughly about $200 per kw.; the 3,000-cycle units were used for melting up to 200 lb.; the 1,000-cycle units for 300 lb. and more, and the 180-cycle type employed for melting large quantities.

It was estimated that line or 60-cycle furnaces would melt about 5 lb. of aluminium, or 20 lb. of zinc, per kw. hr., of energy. Metal loss was low, about ½ per cent. on the average, and in the die-casting field there was an increasing use of such furnaces. For aluminium, 100 and 200 kw. furnaces melting 500, and 1,000 lb. per hour, respectively, were being used. Lining life for holding furnaces was about two years, and for melting furnaces about eight months to a year. With zinc, the same furnaces were estimated to melt about four times as much, the lining life being much longer.

Other Sessions

Automotive Castings

Conrad Orloff (Chevrolet Engineering Division, Warren, Michigan), spoke on "Castings and the Automobile Industry" from the automotive engineer's viewpoint. He indicated that the automotive designer had no preference in method of fabrication of a part, as long as it fulfilled its function best at the lowest weight and cost. In materials all that was desired was a sound piece with the necessary physical properties, dimensionally accurate, within required tolerance, and not excessive in cost.

Synthetic Sands

William Shartow (Chevrolet Gray Iron Division, General Motors Corporation, Saginaw, Michigan), pointed out that variations between foundries neces-

American Letter

sitated differences in sands selected, and each foundry had to make its own decisions. He then discussed some defects associated with moulding sand, saying that scabs may be caused by high moisture, excess seacoal and fines, as well as hard ramming. Where flat surfaces were involved, slow pouring might be the cause, and drop outs might result from sand being too weak or too dry. Mould blows could be due to poor permeability, or high moisture, he continued, and pinhole porosity usually resulted from gases generated by excess moisture, or combustible materials, in the sand.

Casting Design

Good casting design was discussed by James L. Raubinger (Central Foundry Division, General Motors Corporation, Saginaw, Michigan). He stated that the primary requirement was that the casting perform its intended function satisfactorily. Additionally, the the cost of the finished product must be kept to a minimum.

WEYBURN ENGINEERING COMPANY, LIMITED—Mr. H. V. Batchelor has joined the board.

Iron and Steel Board's Chairman

Successor to Sir Archibald Forbes as chairman of the Iron and Steel Board when he retires at the end of February will be Sir Cyril Musgrave, Permanent Secretary to the Ministry of Supply.

Sir Archibald Forbes first mentioned his wish to devote his time to his private business interests towards the end of 1957. His resignation has been accepted with regret by Lord Mills, Minister of Power, who has expressed the Government's appreciation of Sir Archibald's distinguished service as chairman of the board.

Sir Cyril Musgrave has been Permanent Secretary to the Ministry of Supply since 1956. He was in the Inland Revenue Department from 1920 to 1937, since when he has been intimately associated with the development of the aircraft industry. He was recruited to Lord Beaverbrook's team at the Ministry of Aircraft Production in 1940, and when that Ministry was absorbed by the Ministry of Supply he became Under-Secretary (Air) at the latter department.

MR. E. E. PHEASEY has been appointed a director and general manager of Kay & Company (Engineers), Limited, a subsidiary of Alenco.

Dinner

WORSHIPFUL COMPANY OF FOUNDERS

The livery dinner of the Worshipful Company of Founders was held by courtesy of the Rt. Hon. the Lord Mayor of London at the Mansion House. It was presided over by the Master, Mr. G. W. Ilsley, A.C.A. At the high table were the Rt. Hon. the Lord Mayor, Alderman Sir Harold Gillett, M.C.; Sir Percivale Liesching, G.C., M.G., K.C.B., K.C.V.O.; the Master Cutler, Mr. J. Hugh Neill; Sir Thomas Eades; Dr. Harold Whitehead, D.LITT.; Mr. R. G. Gillman; Rev. R. B. R. Walker, immediate past-Master; Mr. W. Stovin-Bradford; Mr. A. Stanley Young; Mr. L. A. Keck; the Dean of Lichfield, the Very Rev. W. Stuart Macpherson, M.A.; Mr. Albert Parrott; Air Chief Marshal Sir Frederick Bowhill, G.B.E., K.C.B., C.M.G., D.S.O.; the Prime Warden of the Worshipful Company of Dyers, Lt.-Col. H. F. Holme, M.A., T.D.; Col. R. M. Studholme, O.B.E., M.A.; the president of the Institute of Chartered Accountants, Mr. W. L. Burrows; the president of the Royal Society of British Artists, Mr. Edward I. Halliday; Mr. J. Arthur Taylor; the Hon. Sir Harold O. Danckwerts; Mr. John Taverner; the president of the British Steel Founders' Association, Dr. C. J. Dadswell; the Master of the Worshipful Society of Apothecaries, Dr. N. S. C. Copeman; the president of the Institute of Mechanical Engineers, Air Marshal Sir Owen Jones, K.B.E., C.B.; Lt.-Col. N. W. Dorrity, T.D.; the president of the Institute of Civil Engineers, Prof. A. J. S. Pippard; Mr. G. Paisley; Mr. Alan P Greenaway; Mr. A. G. Young; Alderman Sir Frederick M. Wells, Bart.; Mr. W. Hebden; Mr. H. Morrogh, director-elect of the British Cast Iron Research Association; Mr. Donald H. McMorran; Mr. W. A. Smith; Mr. D. S. Young; Mr. C. Littler Smith, Upper Warden, Mr. S. G. Lawrence; Mr. Alderman and Sheriff R. E. Perring and Mr. Sheriff John E. Evan Cook, J.P.

During the evening the Founders' Medals were presented to Dr. J. G. Pearce, C.B.E.; Dr. J. E. Hurst, C.B.E.; Mr. C. C. Booth, J.P., and Mr. J. J. Sheehan, B.SC., by the Master, after their health had been proposed by the Rev. R. B. R. Walker. Entertainment was provided by songs from the Cathedral Singers.

Recipients of the Founders' Medals which were presented at the livery dinner of the Worshipful Company of Founders; (left to right) Mr. J. J. Sheehan; Dr. J. E. Hurst; Dr. J. G. Pearce and Mr. C. C. Booth.

Publications Received

Noble-metal Thermocouples, 2nd Edition, by H. E. Bennett, F.I.M. Published by Johnson Matthey & Company, Limited, 73 to 83, Hatton Garden, London, E.C.1.

The contents give a comprehensive survey of the development of noble metal thermocouples, their applications and methods of calibration. The properties of the platinum-group metals and their alloys in relation to the problem of temperature measurement are discussed, and information is given on the principal causes of deterioration of thermocouples.

Two new sections have been added to the book. The first of these is "Temperature Measurement in Glass Manufacture." Radiation methods of temperature measurement are employed, but these are not as suitable as the thermocouple for accurate temperature determination in the depth of the melt. Moreover, by employing a well protected platinum : rhodium-platinum thermocouple the temperature at chosen points of the melt can be continuously recorded and automatic temperature control becomes possible. The second new section is "Temperature Measurement in the Foundry." This describes the quick immersion technique, which, by employing a suitably sheathed platinum : rhodium-platinum couple and an automatic indicating-recording instrument, provides a rapid accurate and reliable method of determination of the temperature of molten metal. The book is available free on application to the company's publicity department.

100A1, Vol. 1, No. 2. A *Bulletin* published by Lloyd's Register of Shipping, 71, Fenchurch Street, London, E.C.3.

The reviewer's knowledge of just what is done by Lloyd's Register of Shipping has been materially added to following perusal of this *Bulletin*. Lloyd's is not a static organization, but one which moves with the times, and this is well shown by the inclusion in the *Bulletin* of an article on "Oxygen in Steelmaking," for when new methods come into being, Lloyd's have to make up their mind as to whether or not to accept them. A second example is an article on "Reinforced Plastics in Ships," which records the fact that already a number of yachts have been constructed from this material. A third development which comes in for consideration is atomic energy, as this source of power is being used for marine propulsion. To round off this magazine, there is an article of historical value, the story of Montreal—its discovery and development.

Britain's Future and Technical Education. Issued by the Ministry of Education through the Central Office of Information.

It can be presumed that this interesting brochure is intended to be read by the smaller manufacturer, as the larger ones probably know all about the current educational facilities. From its perusal, industrialists will certainly have a much better idea how they fit into the future educational system, but it could equally well be studied by what old-fashioned people still call the "sixth formers," to whom the reviewer deems it would make a special appeal. The subject is of vital—and the writer uses the word "vital" in its correct meaning—importance as the future of this country depends for its very existence on an adequate supply of trained technologists. It is believed that the publication is obtainable from Her Majesty's Stationery Office.

Twenty Questions. Issued by Stewarts and Lloyds, Limited, Brook House, Upper Brook Street, London, W.1.

This booklet asks and answers 20 questions as to the advisability of re-nationalizing the iron and steel industry and, moreover, does it succir.ctly and convincingly. The feature the reviewer did not like is the type of illustration chosen, as the grotesque has never appealed to him, but he probably only represents a small section of the public. Propaganda issued in the past for the retention of both the coal and iron and steel industries as private enterprises was of the defensive type. Now that the public has had some experience of the State monopolies, there is a chance of taking the offensive, and this has been done quite effectively in this 20-page brochure.

Sixth General Report on the Activities of the Community, Vol. II: The Economic and Social Situation. Published by the High Authority of the European Coal and Steel Community, Luxembourg.

The size of this Report—nearly 400 pages—is an indication of the increasing activities of the European Coal and Steel Community. Like this country, it is at present worried about the accumulation of coal stocks at the pitheads, but is still backing the "productivity horse." Not only are statistics of the European outputs included in the Report, but also those of mondial production. (Vol. I, a smaller book, covers the general policy of the High Authority.)

Coke-burning Appliances Handbook: Supplement to the Fifth Edition, published by the Gas Council, 1, Grosvenor Place, London, S.W.1.

The fifth edition of the "Handbook," was published in September, 1957, when it was announced that data sheets on new appliances would be issued periodically. During the last 12 months, newly approved apparatus and modifications to existing appliances have warranted the publication of a 55-page supplement for affixing to the linen guard at the back of the "Handbook."

New Catalogues

Foundry Sand Binders. Presented in the form of a loose-leaf binder, William Aske & Company, Limited, Victoria Works, Waterside, Halifax, have issued a near-complete catalogue of their various productions, although two more sheets, due to the newness of the subject matter, are at present being revised and will be available later. The reviewer has a personal criticism to make of the adoption in this catalogue of kaleidoscopic pictures, for he wholeheartedly dislikes the examples printed as they worry and distract him. Whether or not this dislike is general is not known, but it is worth consideration by those who compile the firm's catalogues in the future. The good points the catalogue carries are the inclusion of export data; photographs of the company's agents and a list of users of the firm's products. All these tend to instil confidence in the products offered. The topics are separately dealt with and, in this connection, many technical data are included and in some cases amusingly illustrated in tables. There is much in this publication to be commended.

Hot-blast Cupolas. Compagnie Generale des Conduites d'Eau, 1, Quay des Vennes, Liège, Belgium, in sending the JOURNAL a copy of their new catalogue referred in a covering letter to the fact that when dealing with a previous catalogue, the reviewer stated that

New Catalogues

the use of surplus gas for ancillary purposes was insufficiently stressed. If that opinion was unjustified, no such charge can be laid against this new publication. Claim No. 5 in the catalogue points out that 40 to 60 per cent. of the top gas leaving the MBC cupola is available for auxiliary heating purposes. The brochure is written in good English, is splendidly and in the main clearly illustrated and is technically very interesting. On page 2, however, a number of graphs have been imposed with yellow colour-printing; even with a magnifying glass, the reviewer failed to decipher these, so he presumes they must have been put there for decorative purposes. The wisdom of this is questionable and this is the sole criticism the writer has to make on an excellent piece of industrial publicity.

Steel Castings. The latest brochure to be issued by F. H. Lloyd & Company, Limited, James Bridge Steelworks, Wednesbury, Staffs, must rank extremely high amongst trade literature issued by the foundry industry —the best of art paper has been used; the colour printing is excellent and the general layout is meritorious. Another outstanding feature is the quality of the photographs, by this the reviewer means an artistic appreciation of the best way of presenting what is purely a mundane subject. In the 50 pages of well-illustrated matter, there has been a welcome departure from the overdose vogue of "bleeding." The brochure is captioned "Masters of Steel," and it is equally true that the company are becoming masters in publicity.

Dust Removal. Folder No. 29, issued by Dallow Lambert & Company, Limited, Thurmaston, Leicester, is specially addressed to the foundry industry. This is commendable, as the majority of publicity issued by firms catering for dust-extraction plant covers the whole of industry. In these cases, the impression received by any particular trade is that looking after its needs is only a sideline as compared with the complete range manufactured. In contradiction, by publishing (in folder 29) 20 pictures of applications of their plant to patternmaking and foundry practice alone, Dallow Lambert give the impression that special study has been devoted to these activities.

Conveyor Systems. Hepburn Conveyor Company, Limited, Wakefield, have issued a catalogue covering the Nomad system of conveyors for foundry applications. Basically a system is made up of standardized units, operating either at floor level or raised on legs, to form a length of parallel rounded top rails on which run wheeled pallet plates. The design of the rails is such that no sand can lodge on them. Obviously a number of modifications and ancillary features can be added to meet the differing conditions encountered in foundries without departing from the standardized units. The system is well described and illustrated in a four-page leaflet.

Iron Castings. Newcast Foundries, Limited, Silverdale, Newcastle-under-Lyme, Staffs, strike a new note in their recently-issued loose-leaf catalogue. First they emphasize that their castings are all painted before leaving the foundry. A series of good photomicrographs follows—with the magnifications properly shown. Then come a collection of pictures of machine-tools by various well-known makers which incorporate the company's castings. The whole constitutes a really good piece of publicity.

Electric Hammer-drills. In technical *Bulletin* No. 35, Victor Products (Wallsend), Limited, Wallsend-on-Tyne, compare three types of hammers for developing percussive action. The third type—based on centrifugal force, is the one which the company manufactures and this is dealt with in some detail. The main features of the hammer are that it idles quietly at very low power consumption, and that rotary action is transmitted to the cutting tool.

Air-powered Drills. Foundries with machine shops attached to them will be interested in publication No. 443 T.E. issued by Broom & Wade, Limited, High Wycombe. It covers the features of Aro-Broomwade portable and stationary Par-A-Matic self-feed air-powered drills. The subject matter is nicely set out in a 12-page illustrated booklet.

Precision Castings. A second excellent piece of publicity has been issued by Monsanto Chemicals, Limited, 575, Monsanto House, 10 to 18, Victoria Street, London, S.W.1. It illustrates and captions a special tape-recorder bridge casting in phosphor-bronze, made by precision-casting methods—actually by the Shaw process. Such a casting does real credit to the foundry industry.

AC Electric-motor Starters. Using numbered illustrations to good advantage, list No. 867, issued by Brook Motors, Limited, Empress Works, Huddersfield, on this subject covers a wide range. On the inside third page of this folder there are tabulated a list of steps to be taken when the functioning of a starter is temporarily held up for checking the likely source of trouble The catalogue is nicely presented and essentially "readable."

Arc-welding Equipment. A 20-page well-illustrated brochure has been received from Rockweld, Limited. Commerce Way, Croydon, Surrey, covering the Autopak-type of equipment. It should be of interest particularly to steelfounders and other readers who practise welding amongst their activities.

House Organs

Nickel Bulletin, November 1958. Issued by the Mond Nickel Company, Limited, Thames House, Millbank, London, S.W.1.

The problem of aerodynamic heating is one with which the designer of high-speed aircraft is permanently confronted. With the advent of supersonic aircraft a solution to the problem is being sought in the use of ultra-high-strength nickel-containing steels or alloys for the relevant airframe components. Other items in the section relating to heat- and corrosion-resisting materials cover various aspects of the physical metallurgy of turbine-blading alloys.

Enchiridion, No. 13; published by Firth-Vickers Stainless Steels, Limited, Sheffield.

This well-produced house organ is, from a commercial angle, marred by the absence of the address of the issuing house. It covers the application of stainless-steel, a subject which lends itself to good display, and installations shown include cocktail bars, machines for the manufacture of cigarettes and domestic appliances. Heavy-industry applications are also shown as well as those for gardening. On the last page are pictures of the castings which gained the premier award at the Paris conference of the European Investment Casters Association.

B.A./Alcoa/TI Negotiations

Ordinary stockholders in the British Aluminium Company, Limited, are urged to reject the offer for their stock made directly to them by Tube Investments, Limited. Lord Portal, chairman of British Aluminium, in a statement issued on December 20, intimated that an increased dividend basis which would give ordinary stockholders a rise of more than 45 per cent. in income is intended by British Aluminium if its agreement with the Aluminium Company of America is approved by the Treasury. This higher dividend will not immediately apply to the £4,500,000 of capital to be issued to Alcoa, which will accept dividends of no more than 12 per cent. up to 1961.

Lord Portal, who says that the Tube Investments' offer [one T.I. £1 ordinary plus 78s. in cash for every £2 B.A. ordinary stock, subject to 90 per cent. acceptance by January 9 or not later than February 9] contains nothing material which was not indicated previously, says the board appreciates that stockholders need as much information as it can give on prospects and the reasons why it considers B.A.'s stock will on any but a very short-term basis, be worth more than is now being offered by T.I.

Confidence in Company's Future

The industry generally considers that demand for aluminium will rise by more than 5 per cent. a year, which means that consumption should double in 14 years, Lord Portal says. For this reason, coupled with the company's development work since the war, the board has always had "great confidence" in B.A.'s future. "It is precisely for these reasons that Tube Investments and Reynolds Metals are seeking to acquire your stock," he adds. The "temporary interruption" in this growth of demand last year affected earnings when the £10,000,000 spent on new capital developments was still unremunerative. In these circumstances, the pattern of earnings can be described as 1955 and 1956, good average years; 1957 and 1958, relatively bad years. Prospects for 1959 and 1960 are "better," as the board considers that demand for aluminium is again on the increase, while in 1960 the group's first major overseas developments will begin to come into their own.

On a conservative basis, Lord Portal continues, "the next two years should hold the prospect of gradually increasing earnings, with a steeper rise when the large capital outlays begin to be remunerative."

Commenting on the "inducement of additional income," contained in T.I.'s offer, he says that the provision of funds by Alcoa will relieve the need for heavy retentions of current earnings. The board feels that "the distribution of a higher proportion of earnings than in the recent past years is fully justified." Subject to Treasury consent to the Alcoa agreement, it is intended to recommend for 1958 a final ordinary dividend of 13¼ per cent., making 17½ per cent. for the year.

"We expect, in the absence of unforeseen circumstances, to maintain the dividends for 1959 and 1960 on the ordinary capital at least at this rate. This would mean to the stockholder an increase in income of over 45 per cent." As this increase would give an unexpected benefit to Alcoa—which is to subscribe for the 4,500,000 £1 shares at 60s. each—Alcoa has agreed that these shares shall not rank for any dividend declared or paid before January 1, 1959, and for each of the years 1959, 1960, and 1961 shall "not rank for any dividend in excess of a dividend of 12 per cent. actual on the capital paid up thereon at the end of such year."

On the question of control, the B.A. chairman refers to T.I.'s intention to vest all the B.A. stock it acquires in a new British company owned 51 per cent. by T.I. and 49 per cent. by Reynolds Metals Company of the US. This new company would become responsible for a vast new field of endeavour "in which Reynolds Metals has been engaged for nearly 20 years, and in which T.I., so far as we are aware, has no experience whatever." He contends that the only reasonable function left to the British controlling interest "would be to endorse the plans of its American partners."

Lord Portal adds: "Under the proposed Alcoa agreement there would be American collaboration and not American domination such as appears inevitable if Reynolds/T.I. take over your company." Stressing that the board believes the arrangement with Alcoa to be "an ideal one" from the company's point of view, Lord Portal declares: "It ensures for British Aluminium the finest technical and development collaboration obtainable." The arrangement, he says, "provides ample cash resources at your company's call over the next three years on inexpensive terms and without displacing the existing body of stockholders. It also immeasurably strengthens directly and indirectly your company's capacity to raise loan capital for its long-term overseas projects.

"The full benefit of the Alcoa partnership and the bright future it offers can only be obtained for the stockholders if the T.I. bid is ignored."

T.I. Meeting

Because the directors of Tube Investments, Limited, believe that stockholders of the British Aluminium Company, Limited, will wish to continue their association with the UK aluminium industry and to participate in the benefits of the proposed merger, TI is securing approval of an increase in capital.

Sir Ivan Stedeford, chairman of T.I., has stated that it was for those reasons that it was decided to offer not only cash but also shares in T.I. for the capital of British Aluminium. An extra-ordinary meeting of shareholders has been formally convened for January 12 to approve the increase of capital by £4,250,000 so that unissued ordinary capital following completion of the deal will be approximately the same as at present. The circular issued to both preference and ordinary holders in T.I. says that except for the issue of shares in response to the offer, the directors have no present intention of issuing any other new shares.

Sir Ivan notes that British Aluminium is a producer of virgin aluminium and states: "The merging of our aluminium interests with that company supported by the financial, commercial, and technical resources of the Reynolds Metals Company of America, one of the largest and most fully integrated aluminium groups in the world, in a manner which ensures retention of control in the UK, will, your directors believe, be of substantial advantage to your company and to the aluminium industry of this country."

Latest Statistics

Copper-base Castings. The October production of copper-base castings was 6,739 tons, according to the December *Bulletin* of the British Bureau of Non-Ferrous Statistics. This is running somewhat better than the monthly averages for the first ten months of 1958, 6,100 tons, or even the 1957 average figure which was 6,378 tons.

Ironfounding: The Council of Ironfoundry Associations states the following number of ironfoundry workers were employed in the United Kingdom during the week ending November 1:—Males 118,647, beginning of October it was 128,158.

A year ago the total was 138,375, whilst at the beginning of October it was 128,158.

News in Brief

TI (EXPORT), LIMITED, announces that contracts for steel tubes exceeding £1,500,000 in value have now been received from the China National Metals Import Corporation.

BRITISH MOTOR-CYCLES to the value of £20,000 have been ordered from Norton Motors, Limited, Birmingham, by the Motokov Foreign Trading Corporation of Prague, Czechoslovakia.

Fuel & Metallurgical Processes, Limited, Dudley, announce the appointment of Mr. G. D. ELLIS, formerly technical representative with Morgan Crucible Company, Limited, as technical sales manager.

AN ORDER for a further 32,000 water meters recently placed with George Kent, Limited, Luton, brings to over £300,000 the value of Kent meters already installed or on order by the Teheran Water Authority since 1956.

THE INDUSTRIAL WELFARE SOCIETY, Robert Hyde House, 48, Bryanston Square, London, W.1, announces a three-day course on industrial and factory law to be given by Mr. Harry Samuels, O.B.E., M.A., from February 3 to 5.

SWIFT LEVICK & SONS, LIMITED, Clarence Steel Works, Sheffield, gave a party to over 200 children of employees and others from the Mount Pleasant and Blackbrook Children's Homes, in the staff canteen on Saturday, December 20.

BROWN BAYLEY STEELS, LIMITED, Attercliffe, Sheffield, gave a Christmas party for retired employees at the Friends Institute, Leeds Road, Sheffield last month. Mr. Harry Bull, managing director, and Mr. W. H. Denton, works director, were among those who welcomed the guests.

THE gaining, despite severe American competition, of an order from Canada for four 3,000 h.p. diesel engines, brings the total of orders, during the past few weeks, for the Stockport firm of Mirrlees, Bickerton & Day, Limited (a member of the Hawker Siddeley Group), to over £1,500,000.

RECENTLY BACK from a 3,000-mile sales tour of Holland, Germany, Austria, Italy and France, Mr. F. Winston Reynolds, chairman and managing director of Winston Electronics, Limited, Sheepperton, Middlesex, stated, that he had appointed head agents in Holland. Western Germany, Austria and Italy.

ARMITAGE & RIGBY (HOLDINGS), LIMITED, the Manchester textile combine, have acquired the whole of the issued share capital of Entwistle (Oldham), Limited, Townfield Street, Oldham. The latter company manufacture stainless heat-resisting, and creep-resisting steel bolts, nuts, studs and allied products.

ONE-HUNDRED ELECTRICAL DETONATORS were stolen last month from a stores at Stanton Iron Works, near Nottingham, by thieves who chiselled their way through a brick wall of the store which stands apart from the main buildings. The detonators were described by the police as "pretty dangerous."

INDUSTRIAL INSTRUMENTS, LIMITED, Buckingham Palace Road, London, S.W.1, announce that they have taken over the representation for London and South-East England of Electronic Switchgear (London), Limited. They also state that they are giving up the representation of West Instruments, Limited, as from December 31, 1958.

THE INSTITUTE OF PERSONNEL MANAGEMENT announce a five-day residential course in "Functions of a Personnel Department," to be held at the Prince of Wales Hotel, De Vere Gardens, Kensington, London, W.8, from January 25 to 30. Details are available from the secretary of the Institute, 80, Fetter Lane, London, E.C.4.

DEPARTMENTAL HEADS and administrative staff of the Plessey Company, Limited, electronic engineers, Rotherham, visited the company's Swindon division over the weekend of December 20. Since work formerly carried out at Rotherham is to be transferred to Swindon in 1959, the party was interested in not only the factory but also in housing facilities.

FOUNDRY SERVICES, LIMITED, Long Acre, Nechells, Birmingham 7, announce the addition of Brixil 77 to their extensive range of Foseco products. This is a silicon briquette made in two sizes, the smaller of which weighing 2½ lb. releases 1 lb. of silicon; the larger, weighing 5 lb. releases 2 lb. of silicon. The briquettes are designed for use in cupola practice.

THE NEW FACTORY which is to be provided at Jedburgh by Roxburgh County Council at an estimated cost exceeding £250,000, is expected to be completed by next summer. Full agreement has been reached between the local authority and the American firm of tool manufacturers, L. S. Starrett & Company, Limited, who are to open the factory. The company will reimburse the Council over a period of 17 years.

BOROUGH POLYTECHNIC, Borough Road, London, S.E.1, is arranging a series of six lectures on "Foundry Sands," by eminent specialists, starting at 7 p.m. on February 24. The lectures are intended for metallurgists and foundry technologists, and additional periods will be arranged for those who wish to undertake organized laboratory work under guidance of the Polytechnic staff. Full details of the course will be published in the near future.

THE INSTITUTION OF ENGINEERS AND SHIPBUILDERS in Scotland have received a gift of £10,000 to endow a Hugh Macmillan Memorial Lecture. The gift comes from the family of the late Mr. H. M. Macmillan and from the Blythswood Shipbuilding Company, Limited, Glasgow, which Mr. Macmillan founded in 1919. Viscount Simon, who is chairman of the Port of London Authority, will deliver the first lecture on February 3 on "The Place of the Technologist in Management."

DEPARTMENTS OF ENGLISH STEEL CORPORATION, LIMITED, Sheffield, were toured, on December 19, by 12 naval officers from the Whale Island Gunnery School, Portsmouth. They were accompanied by Commander M. Blood, sales manager, heavy plate, and by Mr. T. Eyre and Mr. B. Farrell, of the ESC education and training department. The steel-melting and cogging mill, heavy and medium forge, machine-shops, electric melting, drop forging and other processes were seen by the party.

SEVENTEEN EMPLOYEES of Rubery Owen & Company, Limited, Darlaston, received among them approximately £200 for suggestions of methods to reduce production costs. For an improvement in production of axle cases, three employees, Mr. F. Langford, Mr. J. Foster and Mr. T. Treadwell, each received £50. Alderman A. G. B. Owen presented the awards. As an incentive during December the company is awarding a television set for the best suggestion made among its 6,000 employees.

THE PURCHASING OFFICERS, ASSOCIATION announces that a non-residential course on "The Industrial Purchasing Officer's Role in Constructional and Engineering Contracts," for those involved in the letting of contracts for buildings and plant required by their

own organization, will be held at Stationers' Hall, Stationers' Hall Court, Ludgate Hill, London, E.C.4, on February 17-19. Details are available from the Purchasing Officers Association, Wardrobe Court, 146a, Queen Victoria Street, London, E.C.4.

A REPRESENTATIVE OF MORPHY-RICHARDS, LIMITED, electrical manufacturers, has confirmed that the extension of their present Dundee factory will be open and operative by the late spring. Under an agreement reached with the BoT another large factory will be built for the firm at Dundee for renting in two or three years' time. The new factory will cover approximately 300,000 sq. ft., and it is understood that it will initially employ between 700 and 800 workers. The number might be doubled at a later stage.

BAKER PERKINS, LIMITED, announce that, following agreement with A. Triulzi S.A.S., die-casting and injection-moulding machinery manufacturers, Triulzi machines will be built by Baker Perkins in Britain. The Triulzi range of die-casting machines includes units of from 30 to 1,500 tons locking force. Initially, only the 120-ton machine from the die-casting range will be manufactured in Britain; other machines will be imported. Alexander Cardew, Limited, will continue to handle the sales of the machines.

Mr. N. C. MACDIARMID, managing director of Stanton Ironworks Company, Limited, Ilkeston, Derbyshire, speaking at a Christmas party given to 200 old age pensioners who were formerly employed by the firm, said that the recession in the iron and steel trade had affected Stanton Ironworks rather less than many other firms in the country. He said that the recession had been only a relative thing, and common to not only the iron and steel industry in this country but to the industry all over the world.

SOME BRASS SHOE-BUCKLES recently found in the rebuilding of the Guildhall at York, which was destroyed by fire in an air raid in 1942, may form a link in the discovery of an ancient brass foundry near the old Fox Inn in Petergate, York. The buckles are thought to date from the 14th or 15th century, but may be as early as the 11th or 12th centuries. They are just over one-inch long and were probably made from molten brass-alloy in sand moulds, possibly at the recently discovered foundry. Mr. Peter Wenham, lecturer in history at St. John's College, York, found the remains of some hearths and a crucible during excavations this year in Petergate. The slag in them contained some brass and bronze alloy.

Mr. D. A. RICHMOND, director and general manager of Joseph Sankey & Sons, Limited, presented awards worth £300 to students in the company's training school at a ceremony following a tour of the works at Bilston, by parents of the students. Harold Webb, aged 21, received a special prize for being the student of the year. The company has inaugurated a scheme by which youths entering the offices are given a shortened practical course alongside technical apprentices with the objective of giving them a fuller understanding of manufacturing and production problems. The manager of the training school, Mr. R. A. Williams, is satisfied that such a course gives a sounder knowledge of works routine.

Mr. C. L. OLD, group education officer of Vickers, Limited, presented further education awards, worth over £1,300, to 210 employees in the canteen at the River Don works of English Steel Corporation Limited, Sheffield on December 12. Mr. W. D. Pugh, managing director of English Steel, was chairman. Mr. H. Parkin, education and training officer, said that despite trade recession, existing training schemes had been developed. It was proposed to double the engineering training works, and to increase the number of places for trainees in the machine, pattern and foundry shops. He also referred to a training scheme for older employees by which they would be able to get a "new look at the job."

AT AN INFORMAL GATHERING in the canteen of Bradley and Foster, Limited, Darlaston Ironworks, Staffs, 12 employees who had each completed 25 years service with the company were the recipients of gold watches and certificates. Mr. G. E. Lunt, managing director, who made the presentations said that though he described his firm as medium-sized today, 25 years ago it had been a much smaller concern. It had been built around men like the 12 who were present. Conditions in the iron trade were more difficult and certainly more competitive to-day but he was happy to say that there was full employment at Darlaston Ironworks. After the presentations the recipients were entertained to lunch.

SIMMONDS AEROCESSORIES, LIMITED, a member of the Firth Cleveland group, announce the formation in Germany of Deutsche Firth Cleveland GmbH, as a subsidiary company. The new company, which has taken over offices at Neckarauerstrasse 245-53, Mannheim, has been set up in anticipation of the establishment of a Common Market and Free Trade Area in Europe. It will undertake the marketing in Germany of most of the products of Simmonds Aerocessories, Limited, as well as those made by Simmonds British subsidiary—Firth Cleveland Instruments, Limited. Mr. A. A. Puth has been appointed general manager of the new firm. All the products handled will continue to be made in Treforest, Glamorganshire.

AN EXTENSION of the engineering hall at the Birmingham Science and Industry Museum, designed to display engines of historic interest, was opened on December 17 by Mr. W. K. Hutchison, chairman of the South Eastern Gas Board. The engines, mainly steam, have been collected from Midland firms, and the exhibits include a giant 18th century tilt hammer, formerly in operation at an Aston works, which is still capable of striking 200 times a minute. A beam engine built in 1863 is another interesting item. It was made by Easton, Amos & Sons, Limited, and was used for over 80 years at a plant in the Old Kent Road, London. Other historic pieces include an 1860 machine for making cast-iron stewpots; a 1930 die-casting machine, and a pin maker.

AT A PRESS CONFERENCE in Birmingham on December 16, following the meeting of the Midland Regional Board for Industry, the chairman of the Board, Major C. R. Dibben, said while there were no grounds for complacency, the indications were that, at the worst, a static position has been reached, and there was now confidence that a general upward trend could be expected. Many industries in the consumer durable-goods field were experiencing "a strong up-surge in demand." There was, however, considerable concern over the cycle, carriage and wagon industries, which seemed unlikely to participate in the general improvements. A Ministry of Labour report showed that the regional total of unemployed advanced a further 600 between mid-October and mid-November to bring the figure to 41,574. This is understood to be the highest of any corresponding period since the war. The overall unemployment percentage for the region is still lower than the national average—1·9 compared with 2.4 per cent. Mr. Michael Halls, Regional Controller for the Board of Trade, reported an increase in applications for industrial development certificates during November and December.

Personal

LORD REITH has been elected vice-chairman of the British Oxygen Company, Limited.

Sir HENRY SPURRIER has been appointed chairman of Albion Motors, Limited, in succession to the late Sir JACKSON MILLAR. He is chairman of Leyland Motors, Limited, the parent company.

Major-General C. A. L. DUNPHIE, managing director of Vickers, Limited, and chairman and managing director of Vickers-Armstrongs, Limited, has been appointed a director of the Westminster Bank, Limited.

Mr. FRANK RICHARD TETLOW, Manchester city inspector for the Federated Employers' Insurance Association, has been selected as prospective Liberal candidate for the Knutsford Parliamentary Division. He is a Liberal member of Cheshire County Council.

Mr. HAROLD BOWDEN, joint managing director of Keighley Lifts, Limited, has been appointed chairman of Glasgow Engineers, Limited, Lift Works, Bridgeton, Glasgow, following the take-over of the latter company by F. Francis & Sons (Holdings), Limited, Thames Ironworks, London, S.E.13.

Accounts of the Hawker Siddeley Group, Limited, reveal that Sir FRANK SPRIGGS, who earlier this year relinquished his appointment as managing director, has been paid £75,000 compensation. Sir Frank, who had been in the group's employ for many years, was managing director for over 20 years.

Mr. LEONARD WATSON, an executive director of the Fluidrive Engineering Company, Limited, Fluidrive Ironworks, Isleworth, Middlesex, has been appointed managing director in succession to Mr. HAROLD SINCLAIR, who is retiring from that post at his own request, but will continue as chairman and engineering director.

Mr. J. STANLEIGH TURNER has been re-elected president of the Coal Utilisation Council for the eleventh year in succession. Sir JOHN CHARRINGTON has been re-elected vice-president. The four trustees, Mr. STANLEIGH TURNER, Sir JOHN, Mr. R. H. E. THOMAS and Mr. H. V. SHELTON, have also been re-elected.

Mr. LEWIS CHAPMAN, chairman of William Jessop & Sons, Limited, today becomes president of the British Iron and Steel Federation. He succeeds Sir ANDREW MCCANCE, chairman and managing director of Colvilles, Limited. Mr. RICHARD F. SUMMERS, chairman of John Summers & Sons, Limited, has been appointed president-elect of the Federation for 1959.

The Governors of the National College for Heating and Ventilating Refrigeration and Fan Engineering have awarded the associateship of the College to the following students who have been engaged on research projects during the session 1957/58: Mr. L. H. FOLEY; Mr. K. GASKELL; Mr. J. D. HALL; Mr. R. ROBSON, and Mr. W. T. DICKENS.

Mr. FRED GOODINSON, aged 66, the longest-serving employee at the works of Robert Jenkins & Company, Limited, Rotherham, is retiring after 49 years with the firm. A reference to this in the company's *Bulletin* says that although Mr. Goodinson retires as a welder, the firm will also be losing in him "a crane driver, gas welder, oxy-cutter, erector, fitter, tester and fettler."

Mr. G. W. HAND, works director of Firth Brown Tools, Limited, Sheffield, who was leaving after 13 years in the position, received a presentation on December 15 from Mr. T. Ingham, senior superintendent of the firm, on behalf of the works staff. Mr. I. WILLIAMS, who had been works engineer for 22 years, and who was also leaving, also received a presentation. Among those attending at the presentation was Mr. T. H. Burleigh, managing director.

Mr. E. H. EWENS has been appointed chairman of W. Canning & Company, Limited, in succession to Sir ERNEST CANNING. Sir Ernest will resign from the board as from December 31 owing to advancing years. As he has been actively connected with the business for 66 years, and has been chairman since 1920, the directors will recommend an alteration to the articles of association to permit them to confer on him the honorary title of president. Mr. W. H. GRIFFIN has been appointed joint managing director with Mr. Ewens. Mr. B. TROMANS, who has been connected with the chemical division for 17 years, has been elected to the board.

Obituary

Mr. HAROLD LLOYD SMITH, who has died at the age of 59, had been managing director of the H.M.S. Tool & Gauge Company, Limited, Birmingham, since 1933.

The death is reported of Mr. WILLIAM J. CAMBRIDGE (73), former London area manager for Harrison (Birmingham), Limited, brassfounders. He retired in 1956 after 37 years with the firm.

The death took place recently of Mr. JOHN CRAIG, chief buyer of Stewarts and Lloyds, Limited, until he retired in 1952. He was 74. Mr. Craig joined the company in 1912 and went to the works at Corby as head buyer in 1932. Seven years later he was appointed the company's chief buyer.

The death has occurred of Mr. HUBERT L. WILLIAMS, who, until his retirement in July of last year, was design engineer in the heavy construction drawing office of Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield. He had been with the company for 25 years. Mr. Williams was 67.

The death occurred last month of Mr. WILLIAM ELKINGTON WRIGHT, F.C.S., late director of the Pyrene Company, Limited, Brentford, Middlesex. Mr. Wright joined the company nearly 30 years ago and pioneered in this country the use of prosphate-coating processes on a production scale. Due to failing health he retired from the board in 1957, but his advice was always available to the company.

Mr. DAVID ALEXANDER BENNIE, chairman and managing director of David Bennie & Sons, Limited, Glasgow, has died at the age of 71. He was a grandson of the founder of the firm, which he joined in 1914 after training as an engineer. He became chairman and managing director in 1929, and chairman of John Moncrieff, Limited (North British Glass Works), Perth, in 1952, when that company was acquired by David Bennie & Sons.

Mr. R. A. SHERMAN, LL.B., A.C.A., director and secretary of Allied Ironfounders, Limited, was killed in a motor accident on December 16. Mr. Sherman started with Wildash & Company, in 1928 and studied for his law degree. He joined Peat, Marwick, Mitchell & Company, in 1938 and was appointed assistant secretary of Allied Ironfounders in 1946, becoming secretary in 1950 and being elected to the board in 1955. Immediately before his death he had visited the company's overseas subsidiaries in South Africa and Australia. He had been back in this country less than 24 hours when the accident occurred; his wife was also killed in the accident.

Company News

TRIPLEX FOUNDRY, LIMITED—The previous downward trend in the parent company's results has been arrested and the overall improvement in group profit—about £36,000, before tax, for the half-year to September 30, 1958—is substantially due to this, states the chairman, Mr. W. H. L. Harrison. It is hoped that ordinary dividends can be resumed when the year's results are known. The last payment was 7½ per cent. for 1954-55. Profits up to September 30 of the Churchfields Spring Company, Limited, acquisition of which was completed at the end of September, will be treated as capital in the group accounts and are not included in the group's half-year figure.

PYRENE COMPANY, LIMITED, manufacturers of fire extinguishers, etc., of Brentford (Middx)—Additional capital is to be raised to finance the extension and reorganization of the motor-car bumper division, including additional plant and machinery, and also to provide extra permanent working capital called for by the continued expansion of business. The directors propose to raise the additional 2,000,000 ordinary 5s. shares, and to issue 560,000 of them to existing holders, by way of rights, in the proportion of one new share for every five held on December 29, at the price of 16s. per share. The issue is subject to the consent of an extra-ordinary meeting this week. Provisional allotment letters will be posted on January 5. There is no intention at present of issuing any of the balance of the new shares.

H. J. BALDWIN & COMPANY, LIMITED, manufacturers of cable covers, etc., of Nottingham—The company has come to an agreement with Hartley Baird, Limited. manufacturers of electronic, mechanical, and electrical precision equipment, of London, S.W.7, whereby Hartley Baird will purchase the unissued balance of 650,000 ordinary 2s. shares in the company at 4s. a share, payable in cash. The proceeds (£130,000) will be applied as to £65,000 in the purchase from Hartley Baird of 10,714 £1 shares in Duratube & Wire, Limited, and as to the balance in the purchase from Hartley Baird of 471,440 ordinary 1s. shares in Hartley Electromotives, Limited. Both of the latter concerns are private companies and are at present wholly-owned subsidiaries of Hartley Baird, which is itself a subsidiary of Camp Bird, Limited. In each case the interest to be purchased amounts to 30 per cent. of the total issued capital.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

SOUTH AFRICA, January 13—Woodworking machinery. (ESB/30665/58.)

THAILAND, January 9—Hand and double-acting pumps. (ESB/30871/58/ICA.)

SOUTHERN RHODESIA—Mr. L. H. Thompson, managing director, Arrow Bronze Foundry (Pvt.), Limited, P.O. Box 8252, Belmont, Bulawayo, Southern Rhodesia, has informed the United Kingdom Trade Commissioner at Bulawayo, that his company is interested in the possibilities of making bronze or aluminium castings for or under licence to UK firms. It is possible there may be British firms exporting castings of various types to the Federation who might be interested in having them made locally. Such items as pump impellors, and various cast items for railway use have been mentioned. (ESB/29187/58.)

Lost wax casting originated with the Chinese many years B.C

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Raw Material Markets

Iron and Steel

Christmas holidays with many of the foundries extended from December 23 to Monday of this week, while in other areas the New Year break is now holding back production. However, most consumers of castings have also been idle for about the same period, so that the suspension of deliveries has not caused inconvenience. Both the suppliers of castings and of raw materials are hoping that the turn of the year will herald an all-round improvement on the present position.

Some foundries did not fare too badly during the past year, but others experienced a very lean time. The engineering and speciality foundries were able to obtain reasonably good outputs of high-duty castings, and the motor-car industry in particular contributed in a large measure to these results.

Other trades using high-duty castings have been taking up fairly good tonnages. Demands from machine-tool makers are not up to previous levels, and orders have fallen from other users. While the trading results of most of these foundries is at present on a fairly satisfactory basis, overall capacity is by no means fully employed and additional work could easily be accommodated.

None of the foundries, however, has been so badly handicapped owing to shortage of work during the whole of the past year as the light foundries have been; demands for light castings are still low and outputs have been reduced to much below capacity levels. Fortunately, some improvement has lately taken place through the increased demand for castings from the domestic equipment trade. It is hoped that this will continue and that there will also be bigger demands from other consumers of light castings. Most of the jobbing foundries need more work and the textile foundries are quiet.

The requirements of pig-iron for the foundries continue to fluctuate. The low-phosphorus irons are comparatively in biggest demand, and although during part of last year outputs were fully absorbed, increased production of this grade has lately provided additional quantities, which exceed present needs. Hematite pig-iron is also plentiful, and refined iron makers could produce larger quantities than those now being obtained.

Producers of high-phosphorus pig-iron continue to have plentiful supplies available. During the last few months stocks of all grades of pig-iron have risen sharply and the tonnages on hand are much heavier than they have been for some time. Makers of pig-iron are anxious to secure a more evenly balanced position between demands and production and a lessening of their stocks to enable them to work more economically.

Efforts continue to be made by producers and export merchants to dispose of supplies to consumers overseas, but they are up against severe competition at very low prices and orders are difficult to obtain.

The re-rollers also are hoping that the New Year will bring improved business. Trade at most establishments continues dull, and orders for small bars and light sections are scarce. Only for reinforcing material is there a reasonably good demand. For some time trading conditions have been very uncertain and in many instances it has been difficult to find sufficient work for the shortened working period. Home steelworks are able to supply the decreased demands for steel semis without difficulty and larger tonnages are available when required.

Non-ferrous Metals

Non-ferrous metals generally have been colourless during and since the Christmas holiday, and the London Metal Exchange will be closed again to-day (Thursday) for the New Year holiday.

Copper closed steady before Christmas, but there was a rather better tone when the market reopened, due, it is believed, to hopes that trade will be stimulated by the new currency measures. Just before Christmas the US custom smelter price moved up to 29 cents, making a unified quotation on the other side of the Atlantic.

Subdued trading in tin is reported in London, while no more than modest trading has been recorded in lead. Zinc, quiet before the holiday break, was firmer on the resumption.

Short-time Working in Scotland

Redundancy of foundrymen in the Glasgow area is causing concern to Glasgow Members of Parliament, and they will, if possible, refer to it in the debate on unemployment in the House of Commons. During the last 12 months, 800 foundry workers have been paid off, and in the same period there has been much short-time working. In some foundries the men are working three weeks in every four, and in others a three- or four-day week has been instituted.

Amongst foundries affected are those of William Beardmore & Company, Limited, Parkhead; Babcock & Wilcox, Limited, Renfrew; Clyde Alloy Steel Company, Limited, Motherwell; Fullwood Foundry Company, Limited, Hamilton and Mossend; Harland & Wolff, Limited, Glasgow; Hallside Steel Works, Cambuslang; Lion Foundry Company, Limited, Kirkintilloch; Star Foundry Company, Limited, Kirkintilloch; Allan Ure, Limited, Glasgow, and Saunders & Connor, Limited, Barrhead. The foundries at Hurst Nelson & Company, Limited, Motherwell, McCallum & Hope, Limited, Glasgow, and Colston Ironworks, Bishopbriggs, have closed down, and a number of smaller foundries have gone out of business. The heavy-iron shop at the Argus Foundry, Thornliebank, which cost over £250,000 to build, is due to close this month.

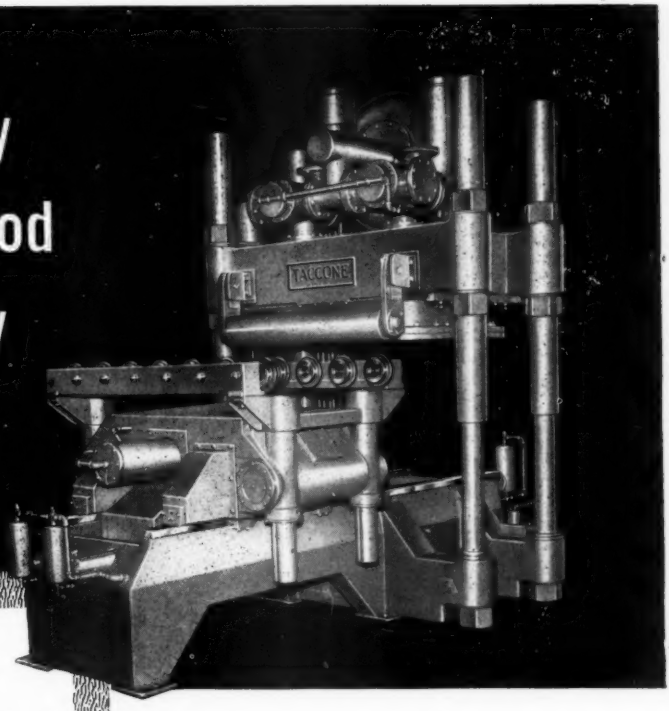
Position in East

The situation on the East coast is also serious. During the past year 300 men have become redundant, and short time is being worked at Aberdeen, Leven, Bathgate, Dundee, the Lothians, and Leith. A foundry in Falkirk is scheduled for closing early in 1959 and the Wallace Foundry, Dundee, was closed down earlier this year, causing 150 foundrymen to lose their jobs. At the North British Steel Foundry, Bathgate, short-time working has been followed by heavy redundancy.

Initially the M.P.s will try to prevent the closing of the Argus Foundry. It is understood that the management feel that the three basic difficulties at present are inability to quote competitive prices; loss of demand for heavy-iron castings due to prefabrication; and the national situation—a falling off in demand and contracting markets. A demand will be made to Mr. J. S. Maclay, Scottish Secretary, and Mr. Ian Macleod, Minister of Labour, to work out with the president of the Board of Trade, Sir David Eccles, a plan to keep the foundry going and to halt the recesssion.

BRITISH OXYGEN COMPANY, LIMITED—Lord Reith has been elected vice-chairman.

An entirely NEW method of Foundry Moulding



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The 'Taccone' machine makes precision green sand pressure moulding available to every foundry. It ensures sound, accurate castings and the moulds it produces are superior to those made by conventional equipment. 'Taccone' moulds are consistently hard and uniform throughout and can be effortlessly produced by unskilled labour

All types of pattern equipment, including plaster, wooden, plastic and metal patterns can be used, and there is practically no limitation on the size of flask employed. 'Taccone' machines are handling flasks 8ft. by 8ft. (larger sizes are envisaged) and already over 200 'Taccone' installations are in operation.

The dimensional accuracy and finish on the castings is comparable with work produced by shell moulding techniques.

The 'Taccone' is more than a machine, more than a process—it is a revolutionary system for rapid mould production.

Ten standard machines are available in the manufacturing range and special machines can be built to any size for any purpose.

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Telephone: JARROW 897124 BP/FI

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

December 31, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.: North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.: N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £41 0s. 0d. to £43 10s. 0d., scale 15s. 0d. per unit; 75 per cent. Si, £56 10s. 0d. to £60 10s. 0d., scale 15s. 0d. to 16s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 8s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 11s. 6d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, nominal, basis 60 per cent. Cr, scale nominal per unit; over 6 per cent. C, nominal, basis 60 per cent. Cr, scale nominal per unit; 2 per cent. C,* 1s. 7¼d. to 1s. 10¼d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 0.15 per cent. C,* 1s. 9d. to 2s. 0¼d. per lb. Cr; 0.10 per cent. C* 1s. 9¼d. to 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 1s. 9½d. to 2s. 0¾d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £265 0s. 0d.; 96/98 per cent., £295 0s. 0d.

Ferro-columbium.—65/72 per cent., Nb + Ta, 19s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £73 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £40 0s. 6d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £67 10s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £220 0s. 0d. to £220 5s. 0d.; three months, £219 5s. 0d. to £219 10s. 0d.; settlement, £220 5s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 1½d. per lb.; rods, 235s. 6d. per cwt. basis; 20 s.w.g., 270s. 6d. per cwt.

Tin.—Cash, £744 0s. 0d. to £749 0s. 0d.; three months, £749 10s. 0d. to £750 10s. 0d.; settlement, £749 0s. 0d.

Lead (Refined Pig).—Second half December, £71 15s. 0d. to £71 17s. 6d.; second half March, £72 0s. 0d. to £72 2s. 6d.

Zinc.—Second half December, £75 15s. 0d. to £76 0s. 0d.; second half March, £72 15s. 0d. to £73 0s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £110 15s. 0d.; rolled zinc (boiler plates), all English destinations, £108 10s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £95 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 8⅞d. per lb.; sheets to 10 w.g., 186s. 6d. per cwt.; wire, 2s. 6⅞d.; rolled metal, 186s. 6d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £144; B6 (85/15), £191; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £182; HTB2 (38 tons), £200; HTB3 (48 tons), £199.

Gunmetal.—BS1400, LG2 (85/5/5/5), £178; LG3 (86/7/5/2), £188; G1 (88/10/2/½), £244; (88/10/2/1), £237.

Phosphor Bronze.—BS1400, PB1 (AID released), £275 per ton.

Leaded Phosphor Bronze.—BS1400, LPB1 (1060), £201 per ton.

Phosphor Bronze Strip, etc.—Strip, 273s. 0d. per cwt.; wire, 3s. 11½d. per lb.; rods, 3s. 2½d.; tubes, 3s. 2¾d.; chill cast bars: solids 3s. 2d.; cored 3s. 3d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 8½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 1½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 0½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £74 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £222; AB2, —.